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We discuss elsewhere the decision of the Interstate Commerce Commission in the Pullman case, which decision is reprinted quite fully in this issue. The dissenting opinion of Chairman Knapp is given almost in full. It is an exceptionally good example of clear, common sense reasoning expressed in language that is entirely free from annoying legal phrases and repetition. It will be recalled that Chairman Knapp wrote a dissenting opinion in the Portland gateway case, and that the United States Supreme Court, in overruling the majority findings of the commission, commented on its agreement with the minority opinion.

In connection with the 113 miles of railway track which have been elevated in Chicago about 110 miles of retaining walls have been built. A conservative estimate of the average cost of these walls is \$25 per lineal ft., making the total cost \$14,520,000. In another column we print a paper and discussion dealing with theories of earth pressure, which have a very direct bearing on the question of the best design of retaining walls. Theories of earth pressure have been relegated by many practical engineers to the limbo of discarded thoughts of great minds. They have been regarded for years as the playthings of professors—mathematical recreations interesting because consistent results could be got on paper, but rather neglected by designers because practical men declared them to lack value. The accumulated experience of ages is, instead, relied on by conservative engineers, and practice in regard to them has become settled. The advent of the reinforced concrete wall, however, has made earth pressure a live question. The committee on masonry of the American Railway Engineering & Maintenance of Way Association gave instances in its 1909 report of reinforced concrete retaining walls costing 25 per cent. less than walls of gravity type of presumably equal stability. There are no precedents to guide in the building of this type of wall. Engineers must accumulate experience, and the hypothesis as to earth pressure will govern in design until safe precedents are established. Only experience and such discussion as that of Mr. Mohler's paper will bring out the true worth of the theory advanced by the author of that paper. Its main immediate value to interested parties will, perhaps, be in the discussion it evokes. The reinforced concrete walls costing 75 per cent. as much as plain concrete walls of the same computed stability were designed in accordance with a theory generally believed to err far on the safe side. This being the case, extensive experiments and good discussions may result in a further reduction of cost. Bridges have been built from time immemorial, but rule of thumb methods were followed until the advent of railways. Their coming caused the importance of a knowledge of stresses in bridges to be realized; and careful studies were made with the result that less than 70 years ago an American showed the world how to effect economy in bridge design. A realization that safe retaining walls of reinforced concrete cost much less than gravity walls, even when designed according to a hypothesis rather than by following a theory demonstrated to be true by experience, should lead in the near future to a settlement of moot questions involving earth pressure. The railway engineers can settle these questions if backed by proper authority and given the money to make proper experiments.

The restaurant at the Grand Central station, New York City, now puts up an attractive luncheon for travelers. It is packed in a box convenient for carrying, and consists of four sandwiches of different kinds, olives, cake, fruit and a paper napkin. The price is 35 cents. In England, where dining cars are not so nearly universal as here, the sale of filled lunch baskets is common on all railways. In this country the field is limited, but there certainly is a field in large cities, particularly on Sundays and holidays during the summer when a day's excursion into the country is popular. The convenience of being able to pick up an attractive lunch at the last minute instead of preparing it at home in advance is sure to be appreciated. No one who has gone up from New York to New Haven on the day of a big football game will forget the discomfort and difficulty of getting luncheon after arriving at New Haven. Again, the lunch basket ought, if possible, to be popularized, as a means of promoting the simple life. We cannot say that any railway officer has a duty to spend either money or thought in this direction, but from the passenger's standpoint the matter is not beneath notice. Occasions often arise when, under present arrangements, the choice lies between spending 50 minutes (or more)

in time and 100 cents (or more) in money for a full meal, and going without anything whatever to eat; when the more agreeable way would be to spend twenty minutes, and a reasonable sum, on a light luncheon. By "simple life" we mean not merely abstention from ten-ounce steaks when the appetite calls only for a sandwich, but also avoidance of the irksome waiting which is necessary when dining cars are crowded. Dining cars worked beyond their capacity are now common. Few roads are so reckless of their expenditures as to put on two dining cars when by making a part of the diners wait one car will answer; and the waiting is decidedly unpleasant. The dining car is a great convenience, but it is maintained under serious disadvantages. Inasmuch as most of these difficulties are unavoidable it is regrettable that a considerable percentage of the patrons of the cars must put up with the added inconvenience of waiting for the people at the first table to finish in a leisurely way a five-course dinner. The lunch box has great possibilities as an educator!

PERFORMANCE OF MALLET ENGINES ON THE GREAT NORTHERN.

The figures regarding the performance of the Mallet locomotives on the Cascade tunnel line of the Great Northern, as given in another column, check very closely with observations made on the same type of locomotive elsewhere. It shows that the internal resistances of these engines is very high. On the 1.7 per cent. grade the average resistance of three engines and their tenders was 20,347 lbs. for a weight of 250 tons. Subtracting that due to grade, or 8,500 lbs., we have a remainder of 11,847 lbs. for the total of internal resistances, showing that the engines would not drift down the grade, which is quite in accord with conditions that have been found to exist elsewhere, where steam must be used to take the locomotive down grades of from 1 to 1.25 per cent. The resistance of the consolidation locomotive, weighing 159 tons, was 10,080 lbs. Subtracting that due to grade, or 5,406 lbs., we have 4,674 lbs. for internal resistance, showing that the engine would drift down this grade, though not down one of 1 per cent., which is not quite in accord with practice elsewhere, where consolidations do drift readily down such grades. The Pacific locomotive tested at the same place showed the lowest percentage of internal resistances. It weighed 188 tons and required 10,270 lbs. to haul it. This left, deducting for grade, only 3,878 lbs. for internal resistances.

That the Mallet should hold back with more strenuousness than the ordinary single locomotive is easily understandable, but why its resistance should be so very much greater is not so readily explained. There is, to be sure, the side motion of the boiler on its front supports, and it is evident, from breakages that have occurred, that there should be a greater flexibility between the front and rear trucks than is usually allowed; but even taking these into consideration, it does not explain why the internal resistance of the Mallet should be 2.37 per cent. of its weight as against 1.37 per cent. for the consolidation. It looks as though there were probably some, as yet, undetected binding on the rails, and this suspicion is strengthened by the fact that considerable trouble has been experienced in some places by the breaking of the connections between the two trucks. Adding to this the fact that the consolidation locomotive, with eight wheels coupled, offers a greater resistance than the Pacific locomotive, with but six, it seems as if this binding of the wheel on the rail is a promising place in which to search for the trouble.

Of course the figures given for the engines on the Cascade grade are for resistances set up by an engine being towed; whereas, in service, the locomotive is working under its own steam. This would make some difference in the actual quantities, though the proportions between the several en-

gines would hold, leaving the Mallet with the still unexplained excess.

THE DECISION IN THE PULLMAN RATE CASE.

It is not conceivable that the Pullman Company will submit without a contest to the order of the Interstate Commerce Commission for reductions of its rates. If the validity of the order is litigated, the courts will be called on to pass on several interesting and important questions.

In the first place, it is a question whether the commission has jurisdiction over sleeping car rates. Sleeping car companies are declared to be common carriers by the Hepburn act. But is a sleeping car company a common carrier in fact? And if it is not, can it be made one by legislation? Such a company does two distinct things. It furnishes the traveler with a seat to sit in and a berth to sleep in; for this it is paid by the traveler. It also provides him a car to ride in, and for the use of this car the railway which furnishes the motive power and the track usually pays on the basis of the mileage the car is hauled. In the latter capacity, the sleeping car company is plainly an agent of the railway. It has been contended that in its former capacity it is an innkeeper. If in this capacity it is an innkeeper, can congress or the commission regulate its charges, as such? It seems rather probable that the courts will hold that it is really the agent of the railway in both capacities, and that, therefore, it is a carrier whose charges are subject to regulation to the same extent as are those made by the railway for transportation.

If the courts do so hold, they will then have to pass directly, it would seem, on the legality of the commission's order regarding the Pullman Company's rates. The commission really made two rulings. One is that it is unfair to charge the same for an upper as for a lower berth. We have heard some persons say that they prefer an upper berth. They are decidedly exceptional. To a great majority the value of the service rendered in providing them with a lower berth is much greater than that rendered in providing them with an upper. On this basis it seems an unfair discrimination to charge the same for an upper as for a lower, and the commission appears justified in requiring that a difference be made in the rates.

The second ruling of the commission, from which Chairman Knapp and Commissioner Harlan dissent, is that the rates of the company as a whole are unreasonable, this being based, seemingly, entirely on the ground that it has been earning excessive profits. But the Pullman Company makes cars as well as operate them. As a manufacturer it is not subject to public regulation, no matter how large its profits, as such, may be. Moreover, as a manufacturer it cannot be contended that the company has a monopoly. Therefore, before it can be held that its rates are unreasonable because its profits as a carrier are excessive, its profits as a carrier must be carefully segregated from its profits as a manufacturer. Whether the commission has done this is a question of fact for judicial determination. And even if, after a correct segregation has been made, it shall be found that the company's profits as a carrier are large, it does not follow that its rates may be reduced. Whether a carrier's rates may be reduced merely because its profits are large and regardless of the value of the service it renders, is a question of law which has never been directly passed on by the Supreme Court of the United States. Several million persons testify each year by riding in the Pullman Company's cars that they regard the service it renders as worth what it charges for it. Assuming the Pullman Company will be held to be a common carrier, the case presents as nicely and directly as any that has come under our observation the question of whether a carrier's rates may be reduced merely to reduce and limit its profits.

NEW PHASES OF THE RAILWAY LABOR PROBLEM.

The most striking feature of the railway post-panic year 1908 was, perhaps, the abnormal position into which it forced the railways in their policy toward labor. The panic of 1907 came on and its after results ensued at a time when labor was highly organized and assertive. It threatened in advance strikes should any attempt be made to reduce wages. The only sentimental effect on the labor union of hard times and reduced railway earnings was to suppress its noble rage for an advance of wages and postpone it to better times. The logical sequel in the policy of the railway companies followed and, indeed, was compelled by necessity. Debarred from the natural remedy of reducing wages, with public sentiment set firmly against any increase of rates and with the federal "big stick" and the lesser state sticks in menacing poise, the railways' direction of least resistance was the reduction of forces; and that reduction followed on a very large scale. It ran down in many cases to the lowest point consistent with public safety in operation. The head of one of the large eastern railways could be quoted here as saying at the time that but for the reductions of train service the matter of conserving public safety with his reduced operating force would have been a problem grave if not insoluble.

The reduction had two other aspects, one of them strongly emphasized at the time. It enabled the railway to discharge its least efficient men and, relatively, it made the labor retained more efficient—not only because it was naturally so, but because it was spurred by the fear of losing its job. The other aspect relates to the attitude of organized labor itself. In effect, organized labor proclaimed as its policy the intensified penalty for the few as the better alternative for the slight advantage of the many. The union, rather than assent to a reduction of ten per cent. in the wage, would be willing to see twenty per cent. of its members discharged and go on a basis of semi-starvation. Had the hard times been longer, had they reached down deeper, had they been commensurate with the panic and "long drag" of 1873 and after years, this illogical, not to say inhumane, position of the unions would have come out in more vivid perspective.

With the revival of business on the railways, economic history now repeats itself and organized labor is asking increased wages accompanied with the usual threat of a strike. After an indefinite number of years there will again be a period of railway depression. But through both periods, whether of depression or prosperity, several new facts are beginning to be writ large. One is the tendency of labor to trench more and more upon the railways' gross earning power. Another is the increased unwillingness of the railway to face the consequence of a strike. A third has already been expressed in the experiences of 1908, when for the old and orthodox remedy of wage reduction there was substituted the reduction of the working force, raising sharply the question whether wage reduction hereafter is to be outworn and the more cruel expedient supersede it. But these subordinate questions are lost in a larger one. Insistent claims of labor, making larger and larger drafts upon the earning power of the railways have thus far been measurably met by fresh operating and mechanical efficiencies. But the claims of labor have no natural limit. They grow with labor's own organized strength, while to railway efficiency and economy there must be a limit somewhere. What will be the line of readjustment when this limit is reached? Will there be a reversion to old remedies, or a resort to new ones with some such principle as compulsory arbitration in the foreground, certain to be urged more strenuously as the railways' relation to public necessity and convenience intensifies?

Partly then as the result of economic changes, of which the rise in the cost of living is most prominent, one finds these elements in the railway labor situation, some of them new, some of them old forces but with higher potentials. They

are conspicuous now in the numberless controversies of labor with the railway corporations which are everywhere in the land. Historically speaking, never heretofore have we had general conditions when organized labor has been more assertive, when the railway corporation has been held more unjustly under the restraints both of public sentiment and of civic authority and when the normal economic remedies have been denied them. Large earnings relieve the immediate stress and give a margin for compromise; and when in future years the inevitable backward swing of the pendulum to industrial depression comes, there will undoubtedly be a margin for increased operating efficiencies. But with the present drift of things, in the long look ahead one must forecast with some anxiety the time when the waxing demands of labor, urged at shorter and shorter intervals, overtakes the railway managements' economies.

Letters to the Editor.

WASHING WINDOWS.

Decatur, Ill., April 10, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read J. B. Tate's statement in your issue of April 8, page 937, claiming to have used a device for washing windows several years ago. It is quite possible that this is true. The first ideas of the telephone, automatic coupler, automatic brake, etc., on which thousands of patents have been issued, were claimed by several.

I have seen the cleaning of coaches daily for more than 15 years. I have seen one man with a bucket of water as dirty as the coach, and which had to be replenished every few minutes, and with a brush which he held on the ground with one foot while he jammed a pole into its head, take 40 minutes or more to distribute many buckets of dirty water over the car's surface and down his own arms. This forced upon me the question, Why not provide some way to use an abundance of clear water to flush off all this dirt without getting a drop of water on the man, and do a thorough, workmanlike job in 15 minutes instead of a very bad job in 40.

I have acted as this question suggested and have developed a window washing device from a crude model into a commercial success. This device has been in use by many roads for the past three years and is covered by clear patents. Because someone else may have used a similar device does not affect my claim as inventor and patentee of mine.

GEORGE R. STANTON.

[We publish Mr. Stanton's letter in order to give him the same opportunity to present his case as was given to Mr. Tate last week. This ends the discussion in these columns.—EDITOR.]

LIGHT CENTER SILLS FOR STEEL CARS.

Chicago, April 7, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with interest and considerable surprise your editorial headed "Light Center Sills for Steel Cars" in your issue of March 25, Page 812, and would like to call the attention of your readers to some of the statements in it with which I take issue.

In the first place, you compare the center sills of cars "A" and "B," "B" being a "good design," but fail to state that the center sills of car "A" are designed to carry only the portion of the load coming on the center sills, the trussed sides carrying the majority of the load, while the center sills, of car "B" are designed, quoting from Arbitration Case No. 792, "to carry the entire rated capacity of the car plus 10 per cent. overload plus the weight of the superstructure and 20 per cent. of the gross weight for oscillation." Is it giving car "A" quite a fair deal to compare it with a design almost diametrically opposite, and are comparisons so made of any

value whatever? It is now common practice in both steel passenger and steel freight design to carry the load anywhere from entirely on the center construction to entirely on the side construction, in the latter of which cases the center sills are only called on to resist the pulling and buffing strains and do not, therefore, demand the strength required in the other designs. It is for this very reason that no set rule can be made as to the proportion of center sills, and the 1908 M. C. B. committee on "Steel Passenger Cars" fully appreciated this.

In the second place, the statement is made that the moment of inertia in columns of the same length is a measure of stiffness. It is my understanding that the strength of columns of equal length depends on the least radius of gyration which is the square root of the quotient of least moment of inertia by area, from which it is seen that the moment of inertia is not even simply proportional to the radius of gyration. To illustrate, a 15-in. 33-lb. channel with an area of 9.9 sq. in. has a least "I" of 8.23 and a radius of gyration of 0.91, while a 55-lb. channel with an area of 16.2 in. has a least "I" of 12.19, or 48 per cent. more, and a radius of gyration of 0.87, or 4 per cent. less.

Another point in connection with the subject is that wooden cars when struck will spring to a considerable extent, returning at once to their original shape, and in severe shocks the draft timbers and end sills will fail and perhaps one or more sills will be broken. Everyone agrees that this is a defect for which the delivering company is responsible.

With the steel car, on the contrary, we have not this inherent resiliency, as we might call it, and we have the draft gear secured absolutely solid to the center sills, a condition not possible with wooden draft timbers, so that if the shocks are severe enough the sills may be bent and will remain so as a register of the blow struck. Just because we have used a material in our sills which may be doubled on itself, and not break as does the wooden sill, is it fair to condemn the design because it registers blows which no doubt would completely destroy a wooden car? After an experience of several years with many thousand cars of design "B," cited above, it has invariably been found that when distorted the car had been involved in accidents or struck a terrible blow in switching.

No account has been taken of the fact that all of the bottom members are so combined in the structure as to share in resisting pulling and buffing stresses, and while the center sills are more directly in the line of these stresses, the outside sills take a considerable proportion of shocks received by the frame which are in excess of the draft gear absorption capacity.

In steel car designing the provision for taking care of pulling and buffing stresses and lateral strength may be said to be incidental, as the character of the sections used for securing the vertical strength required have also qualities of lateral strength and cross section which when combined in the structure provide suitable strength in all directions.

GEORGE S. GOODWIN,

Chief Draughtsman, Mechanical Dept., Rock Island Lines.

[The comparison of the two cars made in our editorial was a quotation from the report of the arbitration committee of the M. C. B. Association and Mr. Goodwin's statement that in comparing the stiffness of columns the least radius of gyration should be used is, of course, correct. We are glad to publish the letter, as it will serve to make more prominent the principal point made in the editorial, that under present conditions numerous cases will be presented for arbitration where weak steel center sills have been distorted by severe switching service and the delivering road will not want to accept responsibility for the damage. Mr. Goodwin admits that other cars of design "A" without cover plates have had their center sills distorted by heavy blows in switching; and under present conditions of operating hump yards such severe treatment must be accepted as a necessary condition and not accidental.

He says that no set rule can be made as to the proportions of steel center sills in freight cars, but we believe that if railways continue to build cars with channel center sills without cover plates the distortion by switching will become so frequent that the owners of strong cars which resist such blows will not be satisfied until some rule is adopted which will place a limit on the area of center sills and will require such form of construction as will resist switching blows without distortion. The practice in steel car design described in the last paragraph of the letter, that of making buffing stresses incidental, cannot long continue for, as in the case of cars like "A" design, damage and distortion result from careless practice which is not likely to be improved or prevented in future.

—EDITOR.]

Contributed Papers.

THE AMENDMENT TO THE SAFETY APPLIANCE LAW.

Following is the full text of the Esch bill (H. R. 5702) as it finally passed both houses of Congress and went to the President this week. This law goes into effect a year from next July, and gives the Interstate Commerce Commission power to prescribe standards for sill steps, ladders, grab-irons and running-boards; to require all cars to be equipped with efficient hand-brakes and to change the present standard height for draw-bars.

AN ACT to supplement "An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their cars with automatic couplers and continuous brakes and their locomotives with driving wheel brakes and for other purposes," and other safety appliance Acts, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of this Act shall apply to every common carrier and every vehicle subject to the Act of March 2, 1893, as amended April 1, 1896, and March 2, 1903, commonly known as the "Safety Appliance Acts."

Sec. 2. That on and after July 1, 1911, it shall be unlawful for any common carrier subject to the provisions of this Act to haul, or permit to be hauled or used on its line any car subject to the provisions of this Act not equipped with appliances provided for in this Act, to wit: All cars must be equipped with secure sill steps and efficient hand-brakes; all cars requiring secure ladders and secure running-boards shall be equipped with such ladders and running-boards, and all cars having ladders shall also be equipped with secure hand-holds or grab-irons on their roofs at the tops of such ladders: Provided, That in the loading and hauling of long commodities, requiring more than one car, the hand-brakes may be omitted on all save one of the cars while they are thus combined for such purpose.

Sec. 3. That within six months from the passage of this Act the Interstate Commerce Commission, after hearing, shall designate to the number, dimensions, location, and manner of application of the appliances provided for by section two of this Act and section four of the Acts of March 2, 1893*, and shall give notice of such designation to all common carriers subject to the provisions of this Act by such means as the Commission may deem proper, and thereafter said number, location, dimensions and manner of application as designated by said Commission shall remain as the standards of equipment to be used on all cars subject to the provisions of this Act, unless changed by an order of said Interstate Commerce Commission, to be made after full hearing and for good cause shown; and failure to comply with any such requirement of the Interstate Commerce Commission shall be subject to a like penalty as failure to comply with any requirement of this Act:

*Section 4 of the Act of March 2, 1893, requires grab-irons on the ends and sides of cars.

Provided, That the Interstate Commerce Commission may, upon full hearing and for good cause, extend the period within which any common carrier shall comply with the provisions of this section with respect to the equipment of cars actually in service upon the date of the passage of this Act. Said Commission is hereby given authority, after hearing, to modify or change, and to prescribe the standard height of draw-bars and to fix the time within which such modification or change shall become effective and obligatory, and prior to the time so fixed it shall be unlawful to use any car or vehicle in interstate or foreign traffic which does not comply with the standard now fixed or the standard so prescribed, and after the time so fixed it shall be unlawful to use any car or vehicle in interstate or foreign traffic which does not comply with the standard so prescribed by the Commission.

Sec. 4. That any common carrier subject to this Act using, hauling, or permitting to be used or hauled on its line, any car subject to the requirements of this Act not equipped as provided in this Act, shall be liable to a penalty of one hundred dollars for each and every such violation, to be recovered as provided in section six of the Act of March 2, 1893, as amended April 1, 1896: Provided, That where any car shall have been properly equipped, as provided in this Act and the other Acts mentioned herein, and such equipment shall have become defective or insecure while such car was being used by such carrier upon its line of railroad, such car may be hauled from the place where such equipment was first discovered to be defective or insecure to the nearest available point where such car can be repaired, without liability for the penalties imposed by section four of this Act or section six of the Act of March 2, 1893, as amended by the Act of April 1, 1896, if such movement is necessary to make such repairs and such repairs cannot be made except at such repair point; and such movement or hauling of such car shall be at the sole risk of the carrier, and nothing in this section shall be construed to relieve such carrier from liability in any remedial action for the death or injury of any railroad employee caused to such employee by reason of or in connection with the movement or hauling of such car with equipment which is defective or insecure or which is not maintained in accordance with the requirements of this Act and the other Acts herein referred to; and nothing in this proviso shall be construed to permit the hauling of defective cars by means of chains instead of draw-bars, in revenue trains or in association with other cars that are commercially used, unless such defective cars contain live stock or "perishable" freight.

Sec. 5. That except that, within the limits specified in the preceding section of this Act, the movement of a car with defective or insecure equipment may be made without incurring the penalty provided by the statutes, but shall in all other respects be unlawful, nothing in this Act shall be held or construed to relieve any common carrier, the Interstate Commerce Commission, or any United States attorney from any of the provisions, powers, duties, liabilities or requirements of said Act of March 2, 1893, as amended by the Acts of April 1, 1896, and March 2, 1903 and except as aforesaid, all of the provisions, powers, duties, requirements and liabilities of said Act of March 2, 1893, as amended by the Acts of April 1, 1896, and March 2, 1893, shall apply to this Act.

Sec. 6. That it shall be the duty of the Interstate Commerce Commission to enforce the provisions of this Act, and all powers heretofore granted to said Commission are hereby extended to it for the purpose of the enforcement of this Act.

THE RAILWAYS' COST OF LIVING.

BY FREDERICK E. VOEGELIN.

Everybody is talking about how much more it costs him to live, how much smaller the purchasing power of his income is, than ten years ago. Here is the railways' household account for 1907, compared with that for 1897, as reported by the Interstate Commerce Commission:

	Per mile of line operated.		
	1907.	1897.	Increase, per cent.
Gross earnings from operation	\$11,383	\$6,122	86
Operating expenses	7,687	4,106	87
Income from operation	\$3,696	\$2,016	83
Passengers carried one mile	123,259	66,874	84
Tons carried one mile	1,052,119	519,079	103

Thus, the railways in 1907 carried more than double the number of traffic units they carried in 1897, but their compensation was only one and four-fifths (1.4-5) times what it was ten years before. During that period the average freight rate per ton-mile had been reduced from 7.98 mills to 7.59 mills and the average rate per passenger-mile from 2.022 cents to 2.014 cents. In the year 1907 these reductions amounted, as compared with 1897, to a saving of \$2,217,485 to the traveling public and a saving in freight bills of \$92,274,540 to somebody. For the period of ten years the total savings were \$52,807,368 and \$727,558,714, respectively. We say that somebody got the benefit of the reduced freight rates. The shipper says the consumer got it and the consumer says the shipper got it. But we know that somebody got the money, whoever he is. We also know that, in spite of the large contributions made by the railways toward reducing the transportation item in the cost of living, the latter has steadily increased. Nobody has yet included the railways as a factor in the increased cost of living. Neither has anyone given them credit for what they have done toward reducing it. Any investigation of the causes of the rise in prices will not be complete unless it discovers who is getting what the railways are saving to the public. If the shipper promptly takes advantage of a reduction in freight rates to plead increased manufacturing or selling expenses for the purpose of maintaining his price list, he ought to be exposed. We venture to say that a downward revision of a price-list by a manufacturer or merchant on account of reduced freight rates is unheard of except where competition or differentials force it. The public has every right to know who is pocketing \$73,000,000 a year derived from reductions in freight rates.

Everyone knows that these heavy contributions to somebody have been made, in addition to steadily increasing outlays per unit for railway labor and materials. Let us go a little deeper into the "iron horse's" household account. We will take the wage question first—for it, too, is vexed by a "servant" problem. Here is its list of servants and what it pays them, according to the Interstate Commerce Commission, which supervises and tries to manage its household:

	—1907—		—1897—	
	Per 100 Ave'ge miles daily of compen- sation.	Daily pay roll, per 100 miles.	Per 100 Ave'ge miles daily of compen- sation.	Daily pay roll, per 100 miles.
General officers	3 \$11.93	\$35.79	3 \$9.54	\$28.62
Other officers	3 5.99	17.97	2 5.12	10.24
General office clerks ..	29 2.30	66.70	15 2.18	32.70
Station agents	16 2.05	32.80	16 1.73	27.68
Other station men	67 1.78	119.26	41 1.62	66.42
Enginemen	29 4.30	124.70	19 3.65	69.35
Firemen	31 2.54	78.74	20 2.05	41.00
Conductors	22 3.63	81.18	14 3.07	42.98
Other trainmen	59 2.54	149.86	35 1.90	66.50
Machinists	24 2.87	69.28	15 2.23	33.45
Carpenters	31 2.40	74.40	20 2.01	40.20
Other shopmen	97 2.06	199.82	50 1.71	85.50
Section foremen	18 1.90	34.20	17 1.70	28.90
Other trackmen	162 1.46	236.52	94 1.16	109.04
Switch and crossing tenders & watchmen.	23 1.87	43.01	24 1.72	41.28
Telegraph operators and dispatchers	17 2.26	38.42	12 1.90	22.80
Employees—acc't floating equipment	4 2.27	9.08	3 1.86	5.58
All other employees and laborers	100 1.92	192.00	49 1.64	80.36
Total	735	\$1,603.73	449	\$832.60

By the simple process of subtraction and division we find that the expense of servants required to run the household has increased 93 per cent. in ten years, but that the income of the householder has increased only 86 per cent. during the same period. The increase in the daily wage per servant has been attended by an increase in the number of servants because of a decrease in the hours of labor per servant and an increase in traffic. So much for the servant question for the time being.

What about the cost of supplies required to keep the house-

hold running? In the case of railway labor we do not insist that wages have risen more rapidly than wages in other industries, but in respect to supplies and materials we maintain that the wholesale prices for articles which the railways use have stood at a higher general level than has obtained for any other class of commodities. We submit as evidence a table showing the per cent. of increase in prices for railway materials for 1907 over the average for the period 1890 to 1907 in comparison with other classes of commodities, the figures being based on reports of the Bureau of Labor:

Commodities.	Increase— 36.0 per cent.
*Lumber and building material	35.0
*Metals and implements	28.6
Farm products	23.1
Clothes and clothing	22.1
*Fuel and lighting	14.8
Food, etc.	14.2
House furnishing goods	5.6
Drugs and chemicals	23.5
All commodities	

We have marked with an asterisk (*) the commodities making up the bulk of a railway's purchases. With respect to fuel supplies some will raise the objection that since the railways own a great number of coal mines they get the benefit of increased prices through dividends on their coal stocks, and that it simply amounts to taking money out of one pocket and putting it into the other. We do not think that this argument is sound for the reason that the cost of labor and supplies required to operate the mines is also increasing rapidly.

Below we give average wholesale prices from 1890 to 1899, and prices for 1897 and 1907 for some commodities used by railways:

Commodities.	Average, 1890-99.	1897.	1907.	Inc.* per cent.
Fuel and lighting:				
Bituminous coal at mine, George's Creek, per ton	\$0.8887	\$0.8333	\$1.5375	85
Bituminous coal at Pittsburgh, Youghiogheny, per bushel .....	.0643	.0570	.0824	45
Petroleum, crude, per barrel .....	.9102	.7869	1.7342	120
Petroleum, refined, per gallon .....	.0890	.0900	.1346	50
Metals and implements:				
Auger, extra, 3/4-in., each .....	.1608	.1425	.3600	153
Axes, M. C. O., Yankee, each .....	.4693	.3938	.6800	73
Best refined bar iron from mill, Pittsburgh, per pound .....	.0145	.0110	.0175	59
Butts, loose joints, cast 3x3 in., pr .....	.0316	.0306	.0400	31
Chisels, extra, 1-in., each .....	.1894	.1710	.4438	160
Sheet copper, base sizes, per lb. ....	.1659	.2175	.2792	28
Bare copper wire, per pound .....	.1464	.1375	.2402	75
Files, 8-in. mill bastard, per dozen .....	.8527	.8050	.9975	24
Hammers, Maydole No. 1 1/2, each .....	.3613	.3500	.4660	28
Lead, pig, per pound .....	.0381	.0358	.0552	54
Lead pipe, per 100 lbs.	4.8183	4.3167	6.7050	55
Locks, common mortise, each .....	.0817	.0833	.2000	140
Nails, cut, 8d face & com., 100 lbs.	1.8275	1.3829	2.1625	62
Nails, wire, 8d face & com., 100 lbs.	2.1618	1.4854	2.1167	43
Planes, Bailey, No. 5, each	1.3220	1.2300	1.5300	24
Hand saws, Disston, No. 7, doz.	12.78	12.60	12.95	3
Shovels, Ames, No. 2, per dozen	7.8658	7.9300	7.8400	1†
Steel rails, per ton	26.0654	18.75	28.0000	49
Steel sheets, black No. 27, per lb. ....	.0224	.0195	.0250	28
Spelter, per pound .....	.0452	.0421	.0617	47
Tin, pig, per pound .....	.1836	.1358	.3875	186
Trowels, M.C.O., buck, 10 1/2 in. ea. ....	.3400	.3400	.3400	
Vises, solid box, 50-lb., each	3.9009	3.5000	5.7500	64
Wood screws, 1-in., No. 10 flat heads, per gross .....	.1510	.0850	.1219	43
Zinc, sheet, per 100 lbs.	5.3112	4.9400	7.4858	51
Lumber and Building Materials:				
Common brick, per M.	5.5625	4.9375	6.1563	25
Cement, Portland, per barrel	1.9963	1.9667	1.6458	16†
Cement, Rosendale, per barrel .....	.8871	.7521	.9500	26
Common lime, per barrel .....	.8332	.7188	.9492	32
Raw linseed oil, per gallon .....	.4535	.3275	.4342	33
Hemlock, per M ft.	11.9625	11.0000	22.2500	102
Hard maple, per M ft.	26.5042	26.5000	32.2500	22
Plain white oak, per M ft.	37.4292	36.2500	55.2083	52
Yellow pine, per M ft.	18.4646	16.4375	30.5000	86
Poplar, per M ft.	31.6667	30.6667	58.0833	89
Spruce, per M ft.	14.3489	14.0000	24.0000	71
Shingles, Cypress, per M.	2.8213	2.3500	4.2250	80
Putty, per pound .....	.0158	.0145	.0120	17†
Resin, per barrel	1.4399	1.6125	4.3771	171
Turpentine, per gallon .....	.3343	.2924	.6344	117
Window glass, single, 50 sq. ft.	2.1514	2.1986	2.8133	28
Firsts, 6 x 8 to 10 x 15.				
Window glass, single, 50 sq. ft.	1.8190	1.9630	2.2419	14
Thirlds, 6 x 8 to 10 x 15.				

*Increase, 1907 over 1897.

†Decrease.

One of the heaviest items of maintenance is renewals of rails. The length of life of rails has probably decreased 20 per cent. during the last ten years, owing to greater traffic density, heavier equipment and heavier trainloads. Adding this depreciation to the 49 per cent. increase in price, the cost of 80-pound rail renewals in 1907 was \$163 per mile, compared

with \$95 in 1897, making an increase of 72 per cent. in the cost of the rails themselves, to say nothing of the increased cost of labor employed in relaying or of increased investment necessitated in replacing light rails with heavy. The increase in total cost of material and labor has been greater than the increase in gross earnings.

We have indicated above the movement of prices for about fifty articles entering into the cost of railway operation. They serve only as an indication of the movement of prices for hundreds of other articles that railways require for the replacement and up-keep of their property and that enter into the cost of new equipment purchased. Perhaps some will take exception to a comparison of wages and prices for 1907 with those for 1897, on the ground that it is a comparison of the highest level since 1890, with the level of the year next following that which recorded the lowest level since 1890. It has been said that there is no absolute standard of a reasonable freight rate. Who will say what is a standard price level? There are those who say that the virtue in a panic is that it pricks the inflated business world and reduces it to standard dimensions. If that is so—and there is plenty of room for doubt—then the standard level is constantly rising, for the price recessions in 1900 averaged less than 2 per cent. of the high level in 1899; the recessions in 1903 averaged less than one-half of 1 per cent. of the higher level in 1902, and in 1909 prices had almost regained the new high level reached in 1906 and 1907. Therefore our comparison is valid. We have compared the lowest with the highest point in an upward movement that progressed steadily from 1897 to 1907 with only two slight recessions during that decade.

Railway wages have almost doubled. Prices have advanced in greater or less degree. Rates have declined. But still the railways are not in the hands of receivers. Why? Here is the answer:

Estimated amount of earnings, reinvested in property during last decade, without increase in capitalization	\$500,000,000
Inc., 1907 over 1897.	149 per cent.
Ton-miles	58
Ton-miles per freight locomotive	75
Number of tons in train	126
Passenger-miles	77
Pass.-miles per passenger locomotive	33
No. of passengers in train	

In the *Saturday Evening Post* of January 22, 1910, the following editorial appeared:

"The proposition that railways cannot raise their rates without the consent of the Interstate Commerce Commission probably means that they cannot raise them at all.

"The constant effect of governmental intervention in rate-making undoubtedly will be to lower rates, not to raise them. Therefore some railway men are saying that further intervention, such as President Taft has in mind, must result in governmental ownership, because rates will finally be forced to so low a point that private ownership cannot give an adequate service. This view, we think, is mistaken.

"From 1890 to 1907 the decline in freight rates was 18 per cent. The average ton-mile rate was 9 mills and a fraction in the former year, against 7 and a fraction in the latter. But in 1890 dividends were paid on but little over one-third of outstanding railway stocks, the average rate being a trifle less than 5 1/2 per cent. In 1907 dividends were paid on over two-thirds of outstanding railway stocks and the average rate was 6 1/4 per cent. In short, railroading was far more profitable with a 7-mill freight rate than it had been seventeen years before with a 9-mill rate. The greater profit was due to a far greater volume of business and to more economical operation.

"Railway rates should not be advanced. They are high enough. Wages and even the cost of materials may advance, but the roads will find their profit in increased tonnage and heavier train load."

The proposition that railways "will find their profit in increased tonnage and heavier train load" is unjust and indefensible. The popular belief has been that the railway business is one of "increasing returns." Such writers as Thomas

J. Greene and Professor Emory R. Johnson have supported this theory. In his able work on "Corporation Finance" Mr. Greene says: "Usually the volume of units of traffic increases as the charge per unit falls, so that the road makes as much gross profit from the larger as from the smaller receipts per unit." We quote from Mr. Johnson's widely read book on "American Railway Transportation" the following: "After a railway has been constructed, equipped and put into operation most expenses are independent of the volume of traffic. Until the point is reached when the facilities of a railway are fully utilized, the greater the volume of business (per passenger-mile or ton-mile) the higher are the profits. The railway business is one of increasing returns. A company with a traffic of 1,000,000 tons annually will much more than double its profits by carrying 2,000,000 tons, provided the extra business can be secured without reducing the rates, and if a reduction in rates should be necessary to secure the additional traffic the company will probably add to its profits by taking the extra tonnage."

Mr. Greene's book was published in 1901 and Mr. Johnson's in 1903. We assume that both writers made their observations and drew their conclusions from results obtained during the decade 1890 to 1899, which was marked by three great movements: (1) A falling price and wage level. (2) A growing up of earnings to invested capital by a rapid expansion in volume of traffic. (3) An increase in the train load.

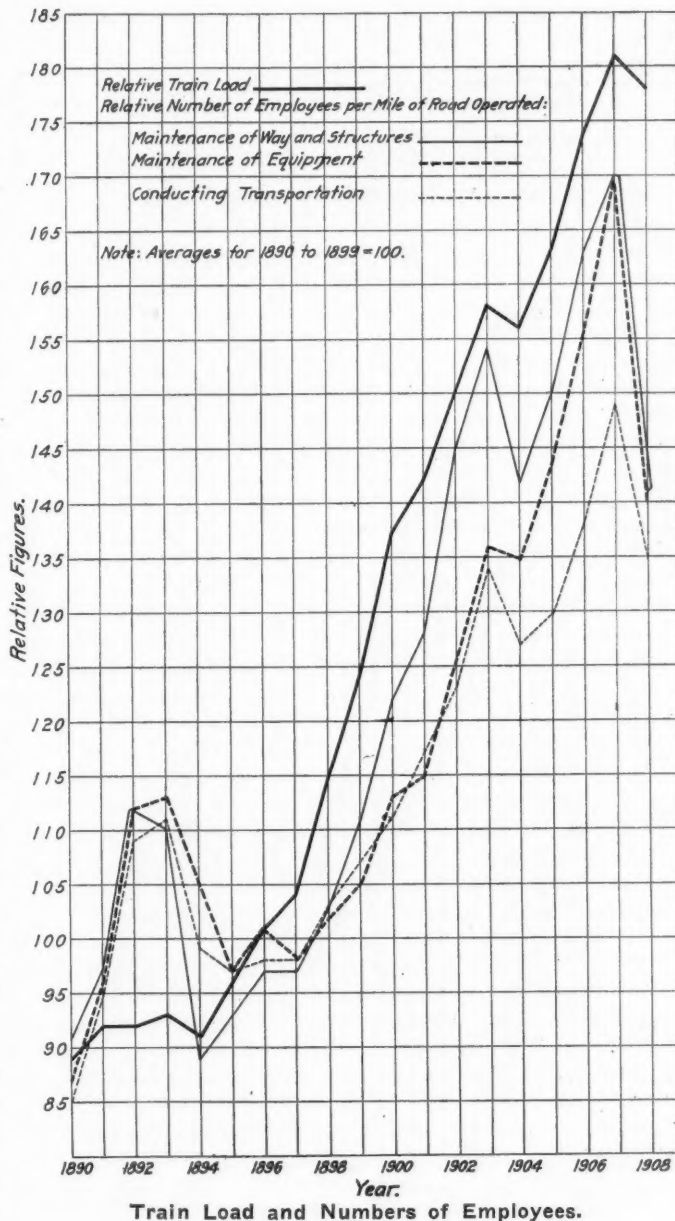
The first of these conditions was sharply reversed in the decade 1900 to 1909; the second and third were continued. The theory that operating expenses are independent of volume of traffic is a flagrant misstatement of facts, under conditions that have existed since 1900. The facts are easily found in the reports of the Interstate Commerce Commission, and they utterly disprove the theory that a railway can double its profits by doubling the volume of traffic. To establish this we submit the following figures, simply to prove that the single factor of quantity of labor required to move traffic is not independent of the volume of traffic moved:

Increase in	1900 over 1890.	1907 over 1900.
Employees per 100 miles of line.....	10 per cent.	39 per cent.
Tons moved	70 "	66 "
Passengers carried	17 "	52 "

In 1907 there was an increase of 64 per cent. over 1897 in the number of men required to move double the tonnage. Therefore had there been no increase in wage rates whatever the railways would have paid out 64 per cent. more in wages in 1907 than in 1897 to move double the tonnage. As a matter of fact, the increase both in the number of employees and in wage rates resulted in an increase of 93 per cent. in the payroll after moving a double volume of traffic, with increased gross earnings of only 86 per cent. How, then, can we say, in face of these established facts, that operating expenses are independent of volume of traffic?

The theory that the railways will find their profit in heavier train loads is as fallacious as the theory that additional tonnage produces clear profit. The established facts disproving the one also disprove the other. The increasing train load is the immediate reason why operating expenses are dependent on the volume of traffic. From 1897 to 1907 75 per cent. increase in the train load brought with it a 76 per cent. increase in the number of employees per mile of line operated engaged in maintenance of way and structures and a 76 per cent. increase in the number engaged in maintenance of equipment. Professor Johnson's theory does not hold true even with expenses for conducting transportation, for the number of employees in this department has increased 52 per cent. with the doubling of tonnage. Nor does it hold true even with expenses of general administration, which amount to less than 4 per cent. of total operating expenses. In this department the number of employees increased 65 per cent. We must also bear in mind that along with declining freight rates the carrier's liability for loss and damage has increased by reason of the rise in prices for commodities carried.

Thus we see visions of doubled profits produced by doubled volume of traffic vanish. We see increased train loads and increased mileage performed by equipment of increased capacity. We are convinced that the point has been reached where the existing facilities of our railways are fully utilized. It is true that the average train load for the United States is far below the average for many of our roads with a great traffic density. On the latter the consensus of opinion among experts is that maximum of efficiency has been reached. On the others the traffic doesn't exist. As evidence of this we point out that total ton-miles increased 149 per cent., while ton-miles per mile of road increased only 103 per cent. from 1897 to 1907. We may feel assured that during a decade of



Train Load and Numbers of Employees.

declining rates and increasing wages and prices every exertion has been made to secure economy and efficiency of operation.

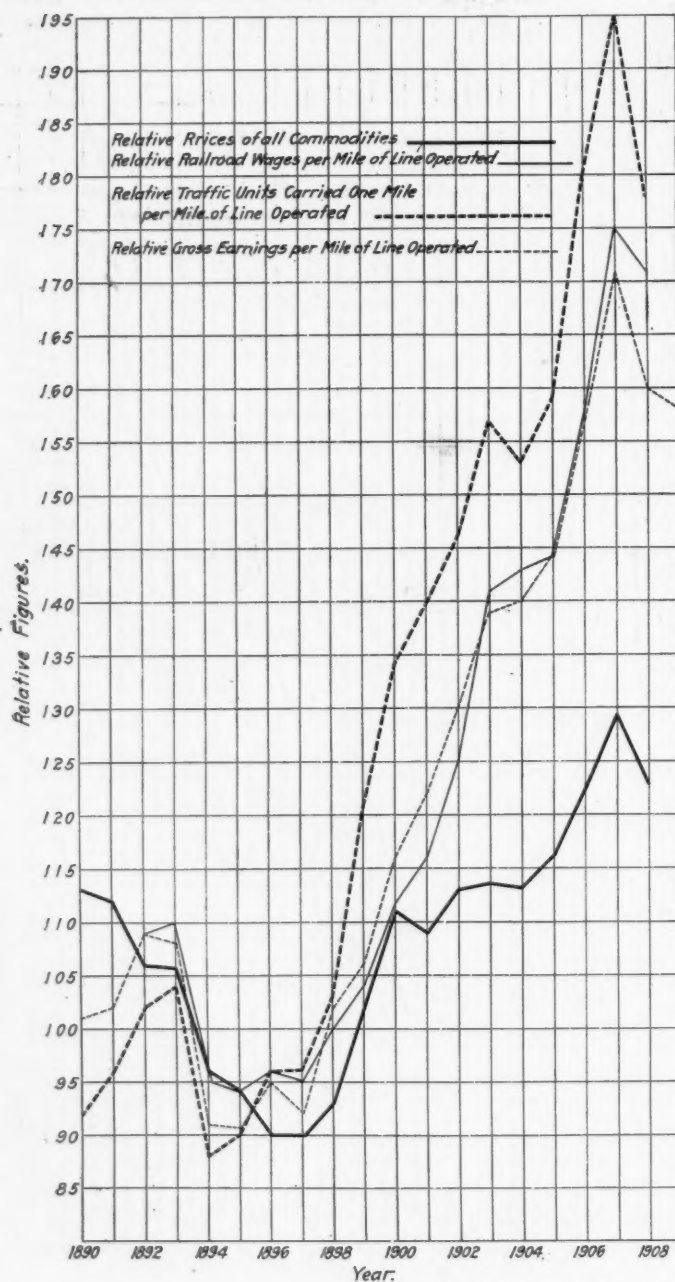
In 1907 there was moved the greatest volume of traffic in the history of American railroading. Instead of finding "increased returns" we find an expansion in gross earnings in less degree than the expansion in volume of traffic, an increase in operating expenses in greater degree than the expansion in earnings, leaving an expansion in profits in even less degree than in gross earnings.

We summarize:

Instead of the railway business being one of increasing re-

turns, or even constant returns, it is a business of diminishing returns under prevailing conditions. Increased volume of traffic and heavier train loads have been followed closely by public demands for improved service, increase in the number of employees per mile of line operated, increased wages per employee, increased prices of materials, reduced rates per ton-mile and per passenger-mile. The sum total is that during a period when railways carried the largest volume of traffic in their history expenses per train-mile increased more rapidly than revenue per train-mile.

The railway business is like any other business, though



Operating Results and Prices of Commodities.

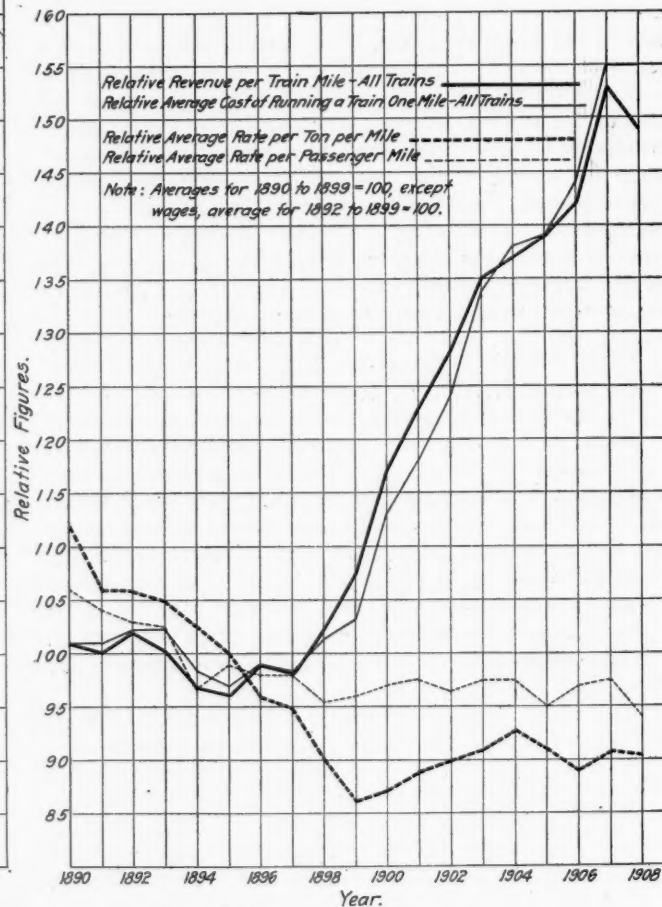
the general public does not realize it. Every manufacturer, whether he is a producer of candy, shoes, power or gas, knows that, other things being equal, the price of his product has declined as the ratio of production (i. e., consumption) to plant capacity has increased, although the rate of profit on his investment remained constant. When, however, the correlation co-efficient equaled 1.00 and increased production could be obtained only by increased investment, he either had to advance the price of his commodity or take a smaller rate of profit, when profits were spread over the enlarged investment, until consumption again grew up to plant capacity.

Every consumer knows that he has to pay more for retail

purchases than for wholesale. The consumer of electric current for one hour a day pays 13 cents per kilowatt-hour, but the consumer who uses it for the full twenty-four hours pays only 2½ cents per kilowatt-hour. The company furnishing the current is a public service corporation like a railway, and we say the discrimination it makes between the big and the little consumer is justified.

Then we turn to the railway and say, figuratively speaking, that the shipper using the railway twenty-four hours a day has no right to a better rate than the one using it only one hour a day. Then we go a step further and say that the railway can increase its carrying capacity "ad infinitum" without having to increase its investment in plant or its cost of production. And then, finally, we say that the railway should electrify and improve its terminals, elevate its tracks and make all kinds of improvements for our comfort and convenience, which do not increase its earning power one cent, and yet be able to maintain the same rate of profit on the increased investment.

Legal doctrines are full of anomalies and human nature is full of inconsistencies. But we are not pessimists. We look forward to the dawn of enlightenment when the general public will realize that the railway business is subject to the same laws that govern all other industries, be they public, quasi-public or private.



Operating Results and Prices of Commodities.

We are not concerned here with the causes of the increase in wages and prices. Whether the tariff, the trusts or the increasing supply of gold are individually and collectively to blame is too big a question to discuss here. We will merely pause and say, (1) that, whatever the cause, rising prices and rising wages increase the cost of materials and operation and tend to decrease the net profits of those companies which cannot advance the price of their products or services at all, or who are not free to advance them as rapidly as prices and wages advance; (2) that if the high price level brings about rising or high interest rates the securities of those companies must decline in their market value.

PULLMAN CAR CHARGES FOUND UNREASONABLE.

George S. Loftus v. Pullman Co. et al. Opinion by Commissioner Lane:

In view of the similarity between the issues involved in these cases, it seems proper to dispose of them in a single report.

The complainant challenges the lawfulness of the standard charge of \$2 exacted by the Pullman Company for a berth in a first-class sleeping car from St. Paul, Minn., to Chicago. Request is made that the rate for the lower berth be fixed at \$1.50 and the rate for the upper berth at 75 cents. [Other rates are complained of and reductions on about the same basis are asked.]

All the rates of which complaint is made are alleged to be unreasonable, and the exaction of the same charge for the use of an upper berth as is made for the use of a lower berth is alleged to be unduly discriminatory. The defendants answer generally, denying that the rates which are the subject of attack are unreasonable or discriminatory or otherwise in violation of the act. * * *

The Pullman Company has contracts for the operation of its cars over virtually every important railway system in the country with the exception of the Great Northern, the Chicago, Milwaukee & St. Paul, and the New York, New Haven & Hartford. The contracts originally entered into by the Pullman Company and the various railways were so-called "scaled mileage" contracts—that is, they provided that a certain mileage payment should be made to the Pullman Company, the rate varying with the amount of the earnings. The revenue from the sale of seats and berths accrued, of course, to the Pullman Company. In some of these earlier contracts the mileage payment was at the rate of 3 cents per mile. A representative modern contract provides that if the average earnings of the sleeping cars operated are less than \$5,000 per car-year the railway shall pay mileage at the rate of 2 cents per mile. If the car earnings average more than \$5,000 but less than \$6,000 per car-year the mileage payment is at the rate of 1 cent per mile. If the earnings are in excess of \$7,000 per car-year the railway is exempt from the payment of mileage. It is provided further that if the earnings per car-year fall short of the stipulated amount the railway company may at its election make up the difference in lieu of paying mileage. Other contracts exempt the railways altogether from the payment of mileage, and still others provide that the Pullman Company shall share with the railway company the earnings from the sale of seats and berths in excess of a certain figure.

For the purposes of this report an extended review of the results of our investigation into the lawfulness of the rates complained of is unnecessary. Suffice it to say that our inquiry has been thorough and has led us to the following conclusions:

The present rate of \$2 for a lower berth from St. Paul to Chicago over the Chicago, St. Paul, Minneapolis & Omaha and the Chicago & North Western is not found unreasonable, but the rate for an upper berth is unreasonable to the extent that it exceeds \$1.50.

The present rate of \$1.50 for a lower berth from St. Paul to Superior is not found unreasonable, but the rate for an upper berth is unreasonable to the extent that it exceeds \$1.10.

The present rate of \$12 for a lower berth from St. Paul to Seattle is unreasonable to the extent that it exceeds \$10. The rate for an upper berth is unreasonable to the extent that it exceeds \$8.50.

The present rate of \$2 for a lower berth from St. Paul to Fargo, N. Dak., is unreasonable to the extent that it exceeds \$1.50. The rate for an upper berth is unreasonable to the extent that it exceeds \$1.10. * * *

An order will be issued in accordance with these findings.

Chairman Knapp, dissenting:

I am unable to concur in the foregoing report and will briefly indicate my reasons for dissenting. Without discuss-

ing whether the profits of the Pullman Company have heretofore been excessive, but expressing my serious disbelief that its current earnings yield more than a reasonable return upon the present value of its property, especially in view of the risks and uncertainties of its business future, I base my objections to the majority report upon altogether different grounds.

The fact that sleeping-car accommodations are furnished by an independent company, which has had an extremely profitable career and may continue prosperous for an indefinite period, seems to me wholly immaterial, except as sleeping-car earnings may properly be taken into account in determining whether the entire revenue from passenger transportation is excessive. In other words, the question presented in these cases is precisely the same, in my judgment, and should be determined by the same considerations as would govern if sleeping cars were provided in all cases by the railways themselves and not, as is the general rule, by an outside company. Nor does it matter, save to the same extent, that the few roads which operate their own sleeping cars, as do the Great Northern and the Milwaukee, realize handsome profits from this branch of their business. It is of no appreciable concern to the passenger, either in sleeper or day coach, whether the car he rides in belongs to the road over which he is traveling or to some other company, and he is equally unconcerned as to which of them gets the money paid for his passage. The real question in all cases is whether unreasonable charges are exacted from the public for any service or facility which a railway is bound to provide or undertakes to provide; and this question, as applied to sleeping-car rates, must be determined wholly by comparison, because there is no other helpful or even available test. What sleeping cars cost, or how much they earn, or what profits are derived from their operation, seems to me of little bearing upon the reasonableness of the charges in question. The facts of controlling weight and the only fair basis of judgment, as I think, are found by comparing sleeping-car accommodations with day-coach accommodations, and what it costs to travel in sleeping cars with what it costs to travel in day coaches. When this comparison is made it becomes evident, to my mind at least, that the transportation charges now paid by passengers in sleeping cars are *relatively lower* than the charges paid by other passengers. The difference in the value of the service is greater than the difference in charge.

The railways in effect furnish two kinds of passenger cars, differing very materially in comfort, convenience, and safety, and passengers may take one kind or the other, as they choose, at the different rates provided. Now, what *ought* to be paid by passengers who elect to take the superior car *in comparison* with what *must* be paid by passengers who take the inferior car because, for the most part, they feel obliged to travel as cheaply as possible? Holding, as I do, that the *relation* between sleeping-car and day-coach rates is the vital matter of concern to the public, and believing that the present differences are of doubtful justice to the day-coach passenger, I can not vote to reduce sleeping-car charges, particularly lower-berth charges, and thereby increase the relative advantages enjoyed by sleeping-car passengers.

A concrete case from the record, which is typical of conditions generally, may serve to illustrate my point of view. The first-class fare from St. Paul to Seattle is \$48.90. For this sum the passenger can make the journey in a standard day coach and have such conveniences as are ordinarily found in passenger cars of that class. By paying \$12 more, or slightly less than 25 per cent., he may travel in a sleeping car so much superior to the day coach as hardly to permit comparison. This car may fairly be called a hotel on wheels, and a hotel of attractive and even luxurious appointments. It is much heavier than the day coach and easier to ride in; its greater strength makes it very much safer. It carries comparatively few passengers, less than half the number that may be crowded into an ordinary car, and its occupants are usually persons of good appearance and unobjectionable manners. In

addition to its sleeping accommodations, which are generally excellent in point of comfort and cleanliness, it has commodious toilet and smoking rooms, with other features of convenience and desirability, including the more or less attentive porter. In such a car the journey is made with little fatigue and often with positive enjoyment. Surely all this is cheap by comparison at the cost of only 25 per cent. above the day-coach rate. Is not the discrimination in fact *against the day-coach passenger?*

On many roads there are trains composed exclusively of sleeping cars and parlor cars, which fall in the same category. Such trains often include observation and buffet cars, supplied with books, magazines and papers, to say nothing of bodily refreshments, and not infrequently carry a stenographer, lady's maid and barber to wait upon the passengers. For all these conveniences and satisfactions the additional charge appears to me extremely moderate in comparison with the accommodations provided for and rates paid by day-coach passengers, and I fail to see upon what ground these additional charges can be found unreasonable.

If the undisputed facts of comparison and the argument, based thereon are given due weight, and they seem to me peculiarly applicable and convincing in these cases, they lead to the conclusion that the sleeping-car charges in question, certainly the lower-berth charges, are not shown to be unreasonable. To reject these facts and their legitimate inferences is, in my opinion, to ignore the element of *the value of the service* and to leave the conclusions of the majority with little support, except the fact that the Pullman Company has made a great deal of money, and that the defendant roads which operate their own sleeping cars have found the business profitable, or at least have so kept their books as to indicate that result. In my judgment, the deduction is wholly unwarranted.

It is a matter of common knowledge that the number of sleeping-car passengers compared with the number of day-coach passengers is relatively small. Leaving out all short-distance travel and taking into account only journeys of, say, 100 miles and upward, much the greater number of travelers ride in ordinary coaches. The remaining minority patronize sleeping and parlor cars, paying the additional charge therefor, as most of them are well able to do. It does not accord with my sense of justice or my understanding of the law which the commission is appointed to administer to reduce the charges voluntarily paid by the limited number of persons who travel in sleeping cars, and I regret a decision which, as I view the matter, will operate unjustly, not perhaps to the Pullman Company, but to the public at large.

On broad grounds of social welfare I have long believed in low passenger fares for everybody, and I shall welcome a material reduction from present rates as soon as it can be made without injustice to the railways. But I would bring this about, if I could, *before* reducing the extra cost of sleeping-car accommodations for the benefit of a comparatively few persons who, in my estimation, are now distinctly favored.

It is evident that the upper berth is less desirable to a substantial degree than the lower berth, and I would agree to some reduction of the upper-berth charges, not because there is any evidence that they are unreasonable *per se*, but because the same charge for both may be fairly regarded as an unjust discrimination against the upper-berth passenger.

I am of the opinion, however, that the difference fixed by the majority report is in some cases too great. For example, when the lower-berth rate is not more than \$1.50, I think a charge of \$1.25 for the upper berth should be allowed.

Commissioner Harlan, dissenting:

I am unable to assent to the conclusions announced in this proceeding in the report of the majority. While concurring in some of the views expressed by the Chairman of the Commission in his dissenting report I place my own dissent upon the general ground that the order directed to be entered is not justified by the record.

A NEW THEORY FOR EARTH PRESSURE.

At a meeting of the Western Society of Engineers in Chicago, Charles K. Mohler, engineer for the Loop Protective Association of Chicago, presented a paper discussing the subject of earth pressure in connection with the design of retaining walls.

Mr. Mohler referred to Fig. 1, illustrating a wall built in Chicago, as a typical case of excessive pressure and consequent settlement. On this point he said:

"While we are greatly in need of more reliable and exact data relating to earth pressure than we now possess, there is one erroneous dogma, which we should lose no time in getting away from absolutely. That is the old text-book statement that 'If the wall is designed so that the resultant of the forces acting on the base cuts the base inside the middle third the wall is safe against overturning.' Under some conditions nothing could be much farther from the truth. *It is a safe*

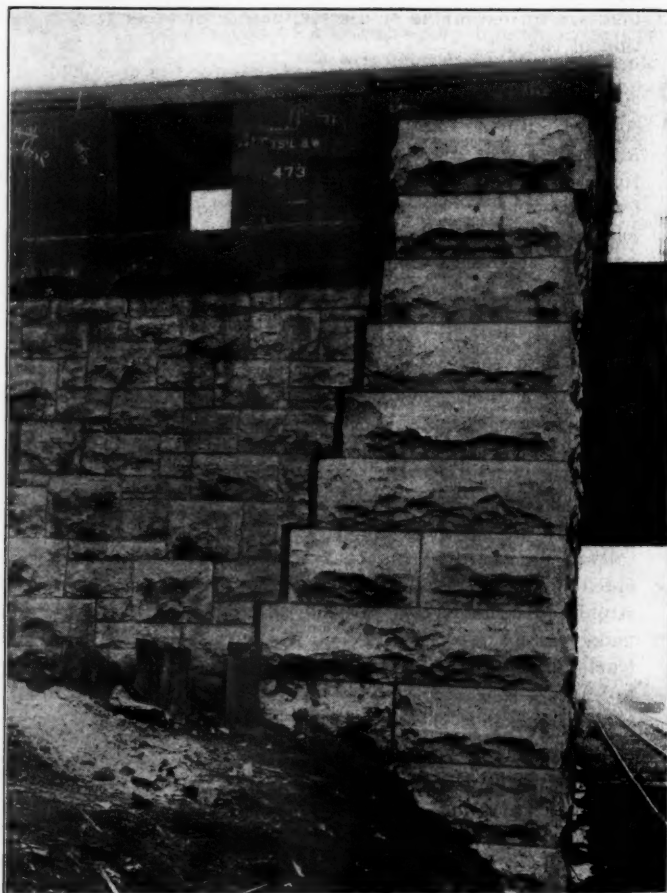


Fig. 1—Retaining Wall Tipped Because of Excessive Toe Pressure.

rule for only one condition, that is where there is a rigid and unyielding foundation such as solid rock. Unfortunately rock foundations are the exception rather than the rule for ordinary walls.

"With a compressible or yielding foundation you cannot expect anything but a cracked or failing wall when the foundation reaction at the toe of the wall is greatly in excess of that at the heel, which the middle-third theory allows and usually gives. Piling is often used to correct the evil and take care of the excessive toe pressure, but even that method, while adding greatly to the expense, often fails to prevent settlement and cracks. The only safe rule is to so design the wall that the resultant will pass through the center of the base, or perhaps a little better, just back of the center.

"The misconception of the middle-third theory and the application of it has alone been responsible for most of the failures

and partial failures of retaining walls and abutments.

"In the treatment of wall design we are at once confronted with the question: What is the amount and direction of the earth pressure against the wall, and how does it affect the direction of the resultant foundation reaction, and the determination of the point at which it cuts the base?"

"It has long been recognized that the data and formulae relating to earth pressure are not as complete and reliable as we should have for correct designing, but for most conditions it is unquestionably better than guessing or working in the dark. Many of the formulae and resulting computations are very long and complicated, and it is almost a hopeless task to work out results for use and comparison."

In order to facilitate design the author computed tables of a

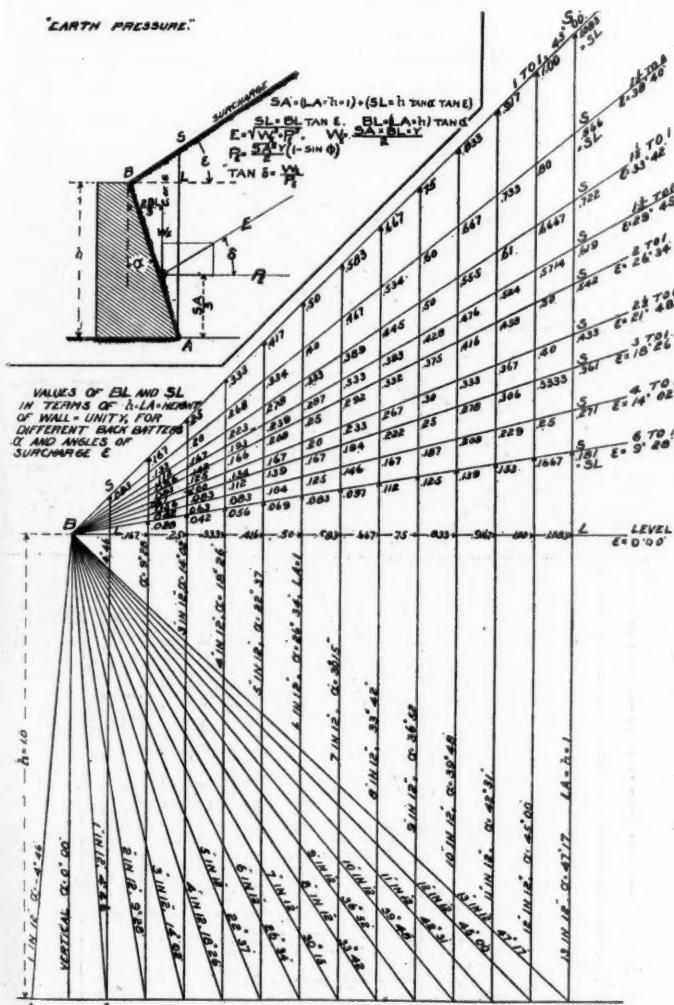


Fig. 2—Surchage Heights, Back of Wall Batter and Surchage Triangle Dimensions.

factor C for a large number of varying conditions governed by angles of repose or natural slope of retained material, batters on back of wall, angles of surcharge, etc., using the Rankine theory and the Rebhann graphical treatment of the Coulcomb theory of the maximum wedge. It was found that there was an agreement only with a wall having a vertical back and a level fill, i.e., no surcharge. A number of diagrams were presented showing conditions within wide limits and illustrating the lack of flexibility in the two theories. The illustrative examples show them to be adapted to ordinary and not exceptional cases.

Continuing, the author said:

"The failures of Rankin and Rebhann under conditions of angle or surcharge ϵ greater than the angle of repose ϕ are very important for the following reasons:

"1st. It is not uncommon to have a bed of sand, gravel or

stiff clay overlying a stratum or bed of very soft material which is penetrated by the excavation. With good, firm material above and below such a stratum, the pressure developed by the flow of the soft material, caused by the superimposed load and high surcharge (over the vertical projection of the back of wall batter) should be considered as giving the amount to be taken care of.

"2d. With a material such as plastic clay the angle of repose for moderate heights may be as much as ninety degrees. At a great enough depth, however, the squeeze is developed and there results a flow in any direction where full resistance is not encountered. It will even heave vertically from the bottom of a pit. That is only a condition where the same material will hold a greater surcharge than the angle of repose or flow at considerable depth. It is probably owing to the cohesion of nearly all materials used in fills that more wall failures have not occurred, where theoretically they should have failed. On account of the cohesion, as well as the friction of the material, to be overcome before an active lateral pressure can be developed, the point of application of the resultant pressure is probably lower than one-third the height of fill h . That being the case the overturning moment would be less than usually computed.

"On account of the great variation and lack of agreement between the analytical theory of Rankin and the sliding prism theory as treated by Rebhann, and their break-downs, the author was led to consider earth pressure from an entirely different point of view.

"The values obtained from the formula for hydrostatic pressure are considered to be beyond question. That being the case, the author was led to try out results by working with the hydrostatic pressure as a base from which to obtain all other values, corresponding to the different assumed angles of repose. Under that conception he treated the angle of repose as the angle at which flow would take place, or the angle of flow. Possibly another conception to take would be to treat it as the angle of resistance to flow, when referred to the horizontal or the angle of flow of a fluid. In fluids the pressure developed by gravity is transmitted equally in all directions. If in any case the substance is considered as losing part of its fluidity, there would then be a certain resistance to flow. If the angle of the resistance is expressed by the slope ratio or the angle ϕ , then the sine of ϕ may be considered as the amount of the resistance. Then we would consider the hydrostatic pressure reduced by the sine of ϕ into the hydro-

static pressure. Hydrostatic pressure $E = \frac{h^2 w}{2}$, in which h equals the height, and w the weight of the fluid retained.

FORMULAE FOR DEVELOPED PRESSURE THEORY.

1st. For Positive Values of a (back batter away from the fill).

For a substance having an angle of resistance to flow ϕ , the formula would become

$$E = \frac{h^2 w}{2} - \frac{h^2 w}{2} \sin \phi = \frac{h^2 w}{2} (1 - \sin \phi), \text{ when } a = 0.$$

When E is the pressure against a vertical plane alone and has no vertical component it may be represented by P .

The values at E at the limiting values of ϕ are as follows:

$$\phi = 0, E = \frac{h^2 w}{2} (1 - \sin \phi) = \frac{h^2 w}{2} (1 - \sin 0^\circ) =$$

$$\frac{h^2 w}{2} (1 - 0) = \frac{h^2 w}{2} = \text{hydrostatic pressure.}$$

$$\phi = 90^\circ, E = \frac{h^2 w}{2} (1 - \sin \phi) = \frac{h^2 w}{2} (1 - \sin 90^\circ) =$$

$$\frac{h^2 w}{2} (1 - 1) = \frac{h^2 w}{2} (0) = 0.$$

For the intermediate value of ϕ we have $\frac{0 + 90}{2} = 45^\circ$, when

$$\phi = 45^\circ, E = \frac{h^2 w}{2} (1 - \sin \phi) = \frac{h^2 w}{2} (1 - \sin 45^\circ)$$

$$\frac{h^2 w}{2} (1 - .707) = \frac{h^2 w}{2} .293. \text{ In other words the intermediate}$$

value of ϕ gives a value for E which is a little over one-quarter that given for $\phi = 0^\circ$ making E the maximum. The increase in the value of E ($= C$) is almost inversely proportioned to the square of decrease of ϕ from the value (90°), giving the lower limit, as by the above formulae.

In which,

E = total earth pressure acting against the back of the wall.

h = height in feet of fill or backing retained.

ϕ = the angle of repose or natural slope of the earth or fill, with the horizontal.

w = weight in lbs. per cu. ft. of the earth fill or backing.

e = angle of surcharge of fill back of the wall, with the horizontal.

a = the angle which the back of the wall makes with the vertical; *positive* when the batter is *from* the fill and *negative* when *toward* the fill, i. e., as a leaning wall.

d = the angle which the direction of the resultant earth pressure makes with the horizontal.

W_E = the weight of the earth wedge carried on the vertical

projection of the back batter $= \frac{h^2 \tan a w}{2}$ and is the vertical

component of the earth pressure.

WALL WITHOUT SURCHARGE.

For back of wall batter, a , positive and $e = 0$, the formula becomes:

$$E = \sqrt{\left[\frac{h^2 w}{2} (1 - \sin \phi)\right]^2 + W_E^2}$$

In Fig. 2 are given the dimensions by which the area of the earth wedge carried over the back of wall batter may be determined. The larger diagram was originally drawn to scale with the height h as unity, and the results checked with trigonometrical formula. Referring to the sketch at the top of the diagram the formula for obtaining the area of the earth wedges ABL or ABS are as follows:

1ST—WALL WITHOUT SURCHARGE.

$$BL = AL \tan a = h \tan a.$$

$$\text{Area } ABL = \frac{BL \times h}{2} = \frac{h \tan a h}{2} = \frac{h^2 \tan a}{2}.$$

2ND—WALL WITH SURCHARGE.

$$SL = BL \tan e = h \tan a \tan e.$$

$$SA = h + SL = h + h \tan a \tan e = h (1 + \tan a \tan e).$$

$$\text{Area } ABS = \frac{BL \times SA}{2} = \frac{h \tan a h (1 + \tan a \tan e)}{2}$$

$$= \frac{h^2 (\tan a + \tan^2 a \tan e)}{2}$$

$$\text{Weight of } ASB = W_E = \frac{w h^2 (\tan a + \tan^2 a \tan e)}{2}$$

The horizontal earth pressure P_e is taken for the full height w SA , and equals $\frac{1}{2} (h [1 + \tan a \tan e])^2 (1 - \sin \phi)$.

With surcharge and back of wall batter away from the fill,

$$E = \sqrt{P_e^2 + W_E^2} =$$

$$\sqrt{\left[\frac{w (h [1 + \tan a \tan e])^2 (1 - \sin \phi)}{2}\right]^2 + \left[\frac{w h^2 (\tan a + \tan^2 a \tan e)}{2}\right]^2}$$

The assumed point of application of P_e is at $\frac{1}{3} SA$ from the bottom.

DIRECTION OF EARTH PRESSURES.

The direction of the resultant earth pressure E with the horizontal equals the angle d , and $\tan d = \frac{W_E}{P_e}$.

The earth pressure P is considered as acting only in a horizontal direction whether the wall carries a surcharge or not. When a mass of earth is either confined in a bin or surrounded

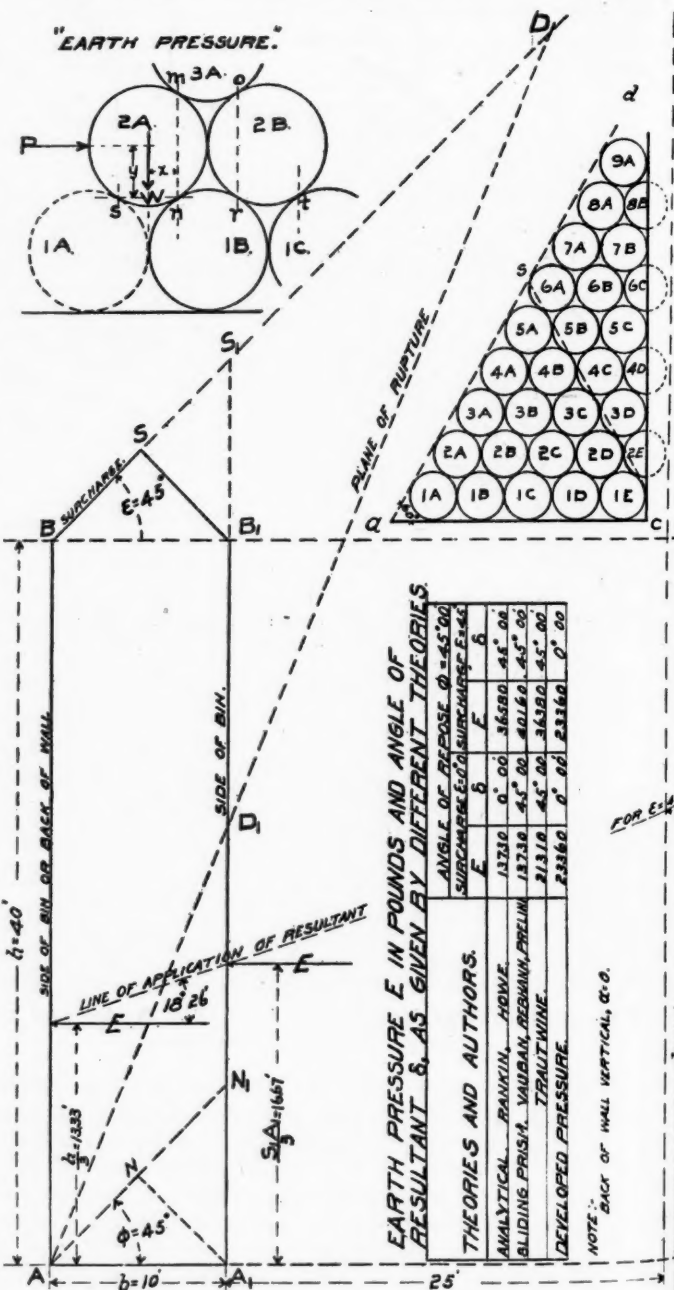


Fig. 3—Effect of Surcharge on Bins and Walls.

by a mass of the same material, and indefinite in extent, the developed pressure producing squeeze, to be in equilibrium, must act and react on the particles within the mass. Consequently the net resultant of the squeeze will be at right angles to the force of gravity.

The case of material simply confined in a bin should not

be confused, however, with the case in which material is withdrawn from the bottom. In the latter case, as soon as material is withdrawn from the bottom, friction is developed against the sides of the bin and the whole case is thereby modified.

For a negative back of wall batter as well as for vertical back, a surcharge fill is not considered as giving any more pressure than if it ran off level or even sloped down away from the back of the wall. To illustrate, take Fig. 3, which represents a bin 40 ft. deep and 10 ft. square. For hydrostatic pressure the amount is the same, whether the fluid pressing against the side of the bin extends back from the face one foot or is of indefinite extent. The same should hold true within certain limits for granular and semiplastic substances. With a bin of the size shown and filled with a granular mass possessing little or no cohesion and incompressible, but having sufficient friction between the particles to stand at an angle of repose of 45 deg., there is little reason to believe there would be any more pressure on the side AB with a surcharged slope than with a level top. In the upper right-hand corner of Fig. 3 is sketched what we will term a pile of cylinders, marked $1A-1E$, $1A-9A$, etc. A common example is the piling of barrels. When piled as shown they will stand with a natural slope of 60 deg., and are held in this position by friction alone, as there is manifestly no cohesion. If the cylinders and the plane ac , on which they rest, were to lose all friction they would sink to the level of $1A$, $1B$, etc. As long as the angle of friction between cylinders in contact is greater than 30 deg. the cylinders will remain in equilibrium. (The angle which the tangent passing through the points of contact of the cylinders makes with the horizontal is 30 deg.)

To show that the surcharge of a slope should not increase the horizontal pressure against a vertical surface, consider the cylinders $1A$, $2A$, $3A$, $1B$ and $2B$ of ad . While $1A$ evidently holds the whole tier $2A$, $3A$, $4A-9A$ in position, it does not carry any more weight or thrust than if only $1A$, $2A$ and $2B$ were considered. $1A$ and $1B$ carry $2A$ with points of contact or support at s and n . (See enlarged sketch of cylinders at upper left-hand corner.) Remove the cylinder $1A$, then to maintain $2A$ in position and equilibrium, substitute a horizontal force P acting through the center of $2A$. Then $2A$ is maintained in position and equilibrium by P and the weight W , acting through their respective lever arms, with n the point of contact as the center of moments. Total moments about $n = 0 = Py - Wx$, from

$$Wx$$

which $P = \frac{Wx}{y}$. But $2A$ carries one-half the weight of $3A$

applied at their point of contact m . By construction, m is vertically above n . Therefore the weight from $3A$ applied at m will pass through the point of support n . As n is the center of movements for $2A$, the weight from $3A$ and passing through n will not disturb the equilibrium of $2A$ already established. The horizontal thrust P will not be increased by the added weight at the point of contact, so long as the angle of friction between the surfaces is greater than 30 deg. The other half of the weight of $3A$ is carried by $2B$ from the point of contact o and passed on to r without disturbing the equilibrium of $2B$. Thus it is seen that the cylinders above do not disturb the equilibrium or produce an added horizontal thrust in those below, but only contribute their weight to increase the vertical load. This is as it should be, for the particles on a natural slope, to contribute an added horizontal thrust to those below, would imply an arching effect which does not exist. In other words, if arching of that kind took place, we would have the anomaly of the toe of the natural slope of an embankment carrying a load greater than the weight of the material in the vertical projection above.

2d.—For Negative Values of a (back batter toward the fill).

With back batter toward the fill or a negative, the formula employed for obtaining the earth pressure is:

$$E = \frac{h^2 w}{2} \left(1 - \frac{\sin \phi}{\cos a} \right)$$

The values of E at the limits of ϕ and a are:

$$\text{for } \phi = 0^\circ \text{ and } a = 0^\circ, E = \frac{h^2 w}{2} \left(1 - \frac{\sin \phi}{\cos a} \right) = \frac{h^2 w}{2} \left(1 - \frac{\sin 0^\circ}{\cos 0^\circ} \right) \\ = \frac{h^2 w}{2} (1 - 0) = \frac{h^2 w}{2} = \text{hydrostatic pressure.}$$

$$\text{for } \phi = 90^\circ \text{ and } a = 0^\circ, E = \frac{h^2 w}{2} \left(1 - \frac{\sin \phi}{\cos a} \right) = \frac{h^2 w}{2} \left(1 - \frac{\sin 90^\circ}{\cos 0^\circ} \right) \\ = \frac{h^2 w}{2} \left(1 - \frac{1}{1} \right) = 0$$

For $a =$ the complement of ϕ (or when the back batter coincides with the natural slope, $a = 90^\circ - \phi$), then $E =$

$$\frac{h^2 w}{2} \left(1 - \frac{\sin \phi}{\cos [90^\circ - \phi]} \right) = \frac{h^2 w}{2} \left(1 - \frac{\sin \phi}{\cos \text{complement } \phi = \sin \phi} \right) \\ = \frac{h^2 w}{2} (1 - 1) = 0$$

Diagrams were presented giving plotted results of comparisons of the Rankine, Rebhann and developed pressure theories in which the following interesting results were noted: For $a = 0$ and $e = 0$ or ϕ , the values are greater than Rankine or Rebhann give but are less than those given for $a = 0$, $e = \phi$. As previously stated, when $a = 0$, or is negative, a surcharge fill is assumed to give no greater pressure than a fill level with the top of the wall.

The values given by the developed pressure theory are almost a mean of those given by Rankine and Rebhann under the extremes of $e = 0$ and ϕ . For $a = 33^\circ 42'$ and $e = \phi$, the developed pressure formulae give much lower values than the old theories, with one exception. When $\phi = 55^\circ$ Rebhann gives lower values, which is evidently a breakdown for the Rebhann method. The increase in E caused by the added load of the earth wedge with its surcharge is almost offset by the decrease in the horizontal pressure P , as the angle of repose ϕ increases until high values of a and e are reached.

With $a = -4^\circ 46'$ and $-22^\circ 37'$, $e = 0$ and ϕ , the values for the developed pressure theory are almost a mean of those given by Rankine and Rebhann. With $\phi = 45^\circ$ and $e = 0^\circ$ and 45° the developed pressure theory gives larger results, but for $e = 45^\circ$, the results are less with a positive. When $a = 0$, the two curves join while Rankine breaks down and Rebhann gives very low values for $e = 0$.

Mr. Mohler concluded with the following summary:

"No attempt has been made to give a complete mathematical analysis or discussion of the formula used. The results appear to be consistent and without any break-downs.

"Until such time as a set of tests shall have been made on a large scale to verify or disprove any theory, we are only justified in using such theories as give the most rational and consistent results. Small model tests on a material possessing any degree of cohesion are perhaps worse than useless. That is equally true of materials possessing both cohesion and friction between the particles of its composition. Owing to the fact that nearly all retained earth possesses both cohesion and friction, it is quite probable that the full resultant earth pressure is developed at a point lower than one-third the height. As an instance to illustrate the point at issue, observe the caving of an ordinary bank. For several feet at the top the slope is almost invariably vertical.

"It is to be hoped that tests may soon be made on a large scale to give as near as may be, by exact experimental data, the true values for earth pressure.

"In the meantime the author respectfully presents the theory based on the assumption that 'the horizontal pressure is equal to hydrostatic pressure, diminished by the sine of the angle of resistance to flow ($= \phi =$ the angle of repose) into the hydrostatic pressure,' or what I have chosen to call the

developed pressure theory, for the consideration of the engineering profession."

DISCUSSION.

Ernest McCullough, Associate Editor, *Railway Age Gazette*.—Rankine himself pointed out the limitations of his theory, but believed it would serve until proper experiments could be made. The graphical solution by Rebhann of the prism of maximum pressure appeared in 1871, but the work of Weyrauch, published in 1878, was so superior that no prominent English or American author mentioned Rebhann until 1909, when his method appeared in Prelini's book.

Few gravity walls have been built in the construction of which any pretense was made of considering theory. The reason assigned for the failure of the wall illustrated is a case in point. In the picture is shown the cause. The ditch to drain the roadbed passes close to the wall, and no doubt the foundation has become so soft that the toe pressure is excessive.

There are three reasons for requiring the resultant to pass through the middle third: (1) that the maximum pressure will not exceed twice the average, (2) that there shall be no tension on the heel and (3) it is very important that the pressure at the toe be kept well within the limits of the pressure the foundation soil will carry. This can be attained by making the base wide or by driving piles under the toe.

Experience has shown that a rectangular wall with a thickness equal to one-third the height will suffice for average conditions without surcharge if built of first class masonry or concrete. For extraordinary conditions experience and study of good examples will lead to the adoption of a base wide enough to make the wall safe. Sir Benjamin Baker stated that for an engineer to claim he had no retaining walls fail simply proved inexperience and not always superior ability.

Vauban saved material in walls he built by battering the front face and increasing the bottom width. For walls with a vertical back and battered face, sections of equivalent stability are obtained when the thickness at a point one-ninth the height above the base is the same.

Poncelet deduced the following formula for trapezoidal walls with battered face, vertical back and equal moment about the toe:

$$b' = b + \frac{1}{10} b''$$

in which

b' = base of trapezoidal wall

b = base of rectangular wall

b'' = assumed base of battered face = $\frac{h}{\tan B}$

h = height of wall

B = inclination of face to the horizontal

The accuracy increases with the inclination of the face.

I find myself unable to agree with Mr. Mohler on the question of surcharge. Additional height of fill implies additional weight, therefore additional pressure. The toe of a slope having an angle equal to the angle of internal friction of the material is assumed as starting from the foot of the wall. The wall is built to retain material above this slope in which material cohesion is uncertain. Friction alone can be considered, and the effect of friction is lessened if moisture is introduced into the mass, thus increasing the pressure. Assume a wall of sufficient weight and stability to retain a fill and be on the point of overturning; there will be a tendency toward readjustment of all particles above the slope of internal friction starting from the heel of the wall, if additional filling is provided as in case of a surcharge. The assumption of increased pressure against the wall because of surcharge is in agreement with common observation, the results of experiments and theoretical, or hypothetical, deductions. Returning again to the rectangular wall, the following

rules of French engineers are useful for fixing the thickness when there is surcharge:

Let h' = height of surcharge above wall

h = height of wall

b = thickness

$$\begin{array}{l} \text{then } b = \frac{h}{3} + \frac{h'}{3} \text{ if } h' < \frac{h}{2} \\ \text{and } b = \frac{h}{3} + \frac{h'}{15} \text{ if } h' > \frac{h}{2} \end{array}$$

For values of h' in terms of h between 3 and 15, interpolations can be made. The base width or thickness fixed, the face may be battered by the rules already given and a saving in material effected.

For a typical rectangular wall having a thickness equal to one-third the height the three fundamental formulae are practically as follows:

$$\text{Horizontal thrust} = 16 h^2$$

$$\text{Overturning moment} = 5.4 h^3$$

$$\text{Resisting moment} = 11 h^3$$

the assumptions being, a fill level with the top of the wall; the weight of the fill per cu. ft. being 82 per cent. of the weight of the masonry; the factor of safety against overturning being 2 +.

Walls built now seldom have much face batter, the slope being on the back throwing the center of gravity forward. All the earth resting on the rear projection of the wall adds weight, so the center of gravity of the composite section is found, a vertical being passed through it. The line of thrust is drawn through this vertical and from the point of intersection are plotted the thrust, and the weight of the composite section. Completing the diagram by drawing the resultant, the stability of the wall is determined.

The angle the resultant makes with the vertical depends upon the weight of the composite section, the amount of thrust and the angle of thrust. In the Coulomb theory no direction was originally indicated for the thrust. Later authorities variously made it horizontal, parallel with the slope of repose or normal to the back of the wall. For nearly fifty years the wedge of earth resting on the rear projection of the wall has been considered as adding weight and stability, the back surface being therefore considered as vertical. Professor Cain assumes the thrust as normal to a line representing the angle of friction between the wall and the earth fill, thus inclining the thrust downwards. Rankine assumed the thrust as parallel with the surface of the fill so that with high surcharge it inclines downward considerably. Experiments indicate that for low walls the thrust acts at about half the height and drops to about four-tenths as the height increases until for walls exceeding 10 ft. the point of application is practically at one-third the height. Many walls are built without making calculations to determine the amount of thrust or probable pressure on the toe. Poor sections often go in merely because they look right. It takes but a few minutes to test the matter by the best information at hand, so this should not be neglected.

It is at this point the theories come in. The formula of Rankine gives considerably higher results than any other, so it is more generally used to-day than the formulae based on the theory of the maximum wedge. The fluid pressure formulae presented to-night by Mr. Mohler seem to be consistent between extremes, so they may be safely used. The fluid pressure idea, however, is not new, for the fluid pressure formula has been used for over a century. Coulomb's theorem was expressed, by a formula in which

w = weight of a cubic foot of soil in lbs.

h = the weight of the wall in feet.

r = the angle of internal friction.

s = the angle at which the effect is lost.

P = horizontal thrust in lbs. against the wall.
then

$$P = \frac{w h^2}{2} \times \cot s \times \tan (s - r)$$

A fluid having no limiting angle of resistance the formula becomes

$$P = \frac{w h^2}{2}$$

Coulomb's theorem showed that the wedge of maximum pressure has a face bisecting the angle made by the slope of repose with the vertical, so

$$P = \frac{w h^2}{2} \cot^2 s$$

for $\cot s = \tan (s - r)$

Assuming sand weighing 106 lbs. per cu. ft. with an angle of internal friction = 30 deg. the above expression reduces to

$$P = 16 h^2$$

one of the fundamental equations already given, representing the horizontal thrust of a fluid weighing 32 lbs. per cu. ft.

The thrust being applied at one-third the height, we have an overturning moment,

$$M O = 16 h^2 \times \frac{h}{3} = 5.4 h^3$$

and for a factor of safety of 2 +, the resisting moment,

$$M_R = 11 h^3$$

fractions neglected.

These equations may be proved in another way. It has been stated that walls with a rectangular section have proved stable when the thickness is one-third the height. Assume such a wall and then alter the form of the section so material can be saved without affecting the stability.

Let W = total weight of wall and earth wedge.

P = horizontal thrust.

b = width of base.

i = intercept on base between resultant and vertical through center of gravity of composite section.

h = height of wall.

then

$$W i = P \times \frac{h}{3}$$

In order that the maximum pressure be not more than twice the average, and that there be no tension at the heel or back

end of the footing, i cannot be greater than $\frac{b}{6}$.

If the moment of stability of the section is equivalent to

$$W i = P \times \frac{h}{3} = 5.4 h^3$$

the wall will be just on the point of overturning about the toe.

When there is surcharge the typical rectangular wall may be assumed and the base broadened in accordance with the empirical rules already presented; calculations then made for stability and an equivalent fluid pressure found, the thrust, of course, being horizontal.

A knowledge of the forces acting to overturn retaining walls is important just now, for reinforced concrete walls are supplanting heavy gravity sections. There is no precedent to guide designers, so theories of earth pressure, long regarded as absorbing mathematical recreations, are coming again to light and probably we are on the threshold of a valuable discussion. Dr. Baker and Professors Turneaure and Maurer have called attention to the thrust of equivalent fluid pressure, found by ascertaining the stability of standard walls evolved by generations of wall builders.

The reinforced concrete wall is seldom more economical than a gravity wall for heights of less than 10 ft. At this height it is well to begin making comparisons, while for walls over 20 ft. in height the reinforced concrete wall is said to show an economy in cost of about 25 per cent. This is worth trying for, and so it seems probable that this type of wall is going to be the wall of the future. Experiments are needed on full size walls, for at present we have records only of experiments on small models with material without cohesion. Until proper experiments are made, however, the equivalent fluid pressure method apparently satisfies requirements.

O. P. Chamberlain, Chief Engineer, Chicago & Illinois Western: Probably in no city in the country within the last ten or twelve years has there been more work done in the construction of retaining walls than in and about Chicago. I presume many of the engineers who have handled this work have not gone very deeply into the theory of retaining walls, but have been guided by precedent. The paper to-night is especially interesting on account of its uniqueness and originality. There was one thing in the discussion by Mr. McCullough I rather expected him to go into a little further. That was the matter of surcharge of a wall. The author of the paper reaches the conclusion that the horizontal thrust will not be increased by added weight at the point of contact, so long as the angle of friction between the surfaces is greater than 30 deg. I take exception to the demonstration in which a number of cylinders of uniform diameter are shown in equilibrium while the angle with the horizontal is 60 deg. This does not prove that a heterogeneous mass of earth would follow the same rule. The condition existing in the example is due to the fact that these cylinders are of uniform diameter and in close contact. If the lower line of cylinders had not been put in close contact the whole mass would fall like a house of cards. It occurs to me that if we can prove by using these cylinders that there is no horizontal thrust we can also prove that the surcharge of earth would stand at an angle of 60 deg., which is, of course, not true. I would say that the fact that these hexagons formed by circles, placed in contact, or by cylinders in a plane which may not be hexagon, made by cylinders placed in contact, do not prove by any means that thrust would not occur in a homogeneous material which we know would not stand at an angle of 60 deg. In fact, we are very certain that a material surcharged over a retaining wall will undoubtedly produce thrust on the wall. I think our old method of treating that is undoubtedly correct. Whether we can measure it exactly or not is another question.

Mr. Wilson: I think it is the general belief that where walls have failed it is due in a great many cases to water making the angle repose much less than the angle which is used in the design of the wall, because the angle which is used in the design of the wall is usually an angle based on the assumption that the material is fairly dry. When this material gets soaked up with water the angle of repose is very small.

W. H. Finley, Assistant Chief Engineer, Chicago & North Western: We are indebted to Mr. Mohler for the work he has put on this paper. I believe there are so many factors we cannot control entering into the pressure on a retaining wall that it is very difficult to make any theoretical deduction. In the city here, where we have built a lot of retaining walls on track elevation, I have noticed many where there is probably a whole block, side walls, retaining walls at each end and abutment in the street—an absolute reservoir, with no provision for draining the walls. One of the points necessary is to have a good foundation and another to be dead sure that the fill is well drained. With those conditions taken care of, I believe that almost any of the accepted methods of designing a retaining wall will give satisfactory results. There is no doubt that the reinforced retaining wall is best. In the stone masonry retaining wall it was just a question of providing a mass to resist the action of the earth. With rein-

forced concrete we have a masonry that will resist tension. The preceding speakers in drawing sections of reinforced concrete walls assumed that you can put a toe in front. You can not always do it, for the wall is on a street line frequently or on a party line. There is no doubt that in extending the base behind and making use of the weight of the earth itself in helping to resist the overturning moment you are getting nearer a correct and an economical solution than by any other method. I have designed a few retaining walls and have noticed a great many built in various sections. I do not remember to have seen a retaining wall that actually failed by overturning. You will see any number where they can be pushed over at first and apparently reach a condition of equilibrium and never move afterwards. I remember, eighteen years ago, in Rockford, Ill., they started a retaining wall, and after it had been built it tilted a certain amount and continued to tilt until it reached a certain position, and it remained that way for years and never moved any more.

Personally I believe you will accomplish more by being sure of your foundation and the drainage of your wall than you will by any mathematical deduction of earth pressures. I believe it so hard to arrive at any satisfactory solution of the factors that you can never get a general formula to cover all cases. Take, for instance, in Chicago, where they are using sand mostly for track elevation. They have a material that is probably as nearly uniform as any material they will get. Yet it will vary in weight considerably, due to the amount of moisture in it, and undoubtedly is very much different from the earth that is usually piled up against a retaining wall. On railroad construction there is no choice but to use the material you have, and it may be a mixture of soil, clay and sand.

W. C. Armstrong, Terminal Engineer, Chicago & North Western: The subject of retaining walls has been attractive for mathematical experts and I think the old rules are near enough correct. I think there has been more worthless mathematics carried out on the subject than on any other one I know of, unless it is methods of calculating earth work. That used to be a favorite subject years ago. In looking over the diagrams in the paper that Mr. Mohler has published and considering the effects within the limits of practice, we do not find they differ much. For a wall with a vertical back, without surcharge, and an angle of repose at $1\frac{1}{2}$ to 1, they practically agree. Those are usual conditions and the results deduced from these conditions give a formula that is near enough for any practical purpose. The only value of a formula in any case is to get uniformity in your construction. We do not know whether the pressures we get from formulae are correct or not. We can never know. I do not believe that any experiments on a large scale or small scale would be of any practical benefit. The pressure that might exist against a wall at one time with the same material would be different at another time. Dry sand is different from wet sand. Dry clay is different from wet clay. The clay may be so wet that you have a hydrostatic pressure. It may be so dry as to shrink away from the wall vertically without any pressure against it whatever. Under such conditions how is it possible to deduce a formula that will give accurate results? The only thing to do is to assume formulae that will give the worst results. The thrust formula I have used for many years is $15 H^2$, always applied at a point one-third up from the base and regarded as horizontal pressure. Then it is simply a matter of mechanics to work out the stability of a wall. I think you all will agree the old formulae give a greater effect because of surcharge than will be found in practice; but to assume that there is no effect from surcharge is certainly an error. If Mr. Mohler had followed out his illustration to a logical conclusion I think he would have arrived at the same result. It is a little difficult to explain without a diagram, but I went into it far enough to satisfy myself that if he had considered the effect of these cylinders on the cylinders below he would have found that they would have

produced an increased pressure against the wall. The design and construction of retaining walls, after all, is a practical question, and it depends more on the method of construction and the drainage of the wall, as Mr. Finley has said, than it does on the theory upon which the design is based. Water will get down back of a wall and freeze. Freezing will expand the material and crowd the wall up. The question of drainage is really the most important one in the construction of retaining walls.

Mr. Chamberlain: Mr. Armstrong has brought out very clearly a point in regard to all formulae which may be used for the pressure on the back of a wall. Of course, to use it practically, we would obtain the horizontal component of the pressure, whether we considered the pressure horizontal or not, originally, and whatever formula we use we are confronted with the fact that the same material, under different conditions, may have a slope which may vary anywhere from a few degrees to almost horizontal. We have all had experience with gumbo soil. If that becomes thoroughly water-soaked it produces almost a hydrostatic pressure undoubtedly, because the material will flow, while under extremely favorable conditions, when there has been a long dry season, it may be cut down almost vertically and will stand. We have to assume as a factor a certain angle of repose, and it seems to me that to split hairs on some other factors in our formula when we have that extreme variable is rather uncalled for. It is enough for a practical engineer to know that he is assuming a pressure on a wall which is sufficient for the worst case.

E. N. Layfield, Chief Engineer, Chicago Terminal Transfer: I have no desire to join in the onslaught against the mathematics of retaining walls, but I never had very much confidence in the value of any of these formulae for the purpose of designing such walls. I think that feeling probably is based on reading a good many years ago the book of Sir Benjamin Baker that Mr. McCullough referred to. Sir Benjamin, if I remember correctly, discussed a number of these formulae at some length and concluded by saying that for ordinary conditions and ordinary materials without surcharge if you were making the wall four-tenths the height you were doing about the right thing. I am frank to admit that when the question of designing the retaining walls of the Chicago Terminal track elevation came up I sent my assistants around town and found out what all the sections were that had been used on other walls and a record as to how they were standing. Between us we cooked up a composite wall that looked good to us and built several miles of it. It is still standing. I will say, however, that the ground under nearly all of these walls was of such a character that we considered it necessary to put piling underneath so that they had a solid foundation, which was practically equivalent to the rock foundation that has been spoken of. It became necessary in some cases where it was impracticable to get the pile driver close enough to buildings to put the piling near the toe of the wall and for us to do considerable figuring as to thickened walls in order to take care of that changed condition. That was merely a question of moment and had nothing to do with the calculation of earth pressure.

I. F. Sterns, Engineer of Bridges, Chicago & North Western: I think that Mr. Layfield touched upon the crux of the matter when he said: "We cooked up a wall that looked good to us." It is very fortunate that the making of the design and the passing on it are in the hands of men who have the preliminary experience to appreciate that even though the figures show something, if it does not look good it ordinarily is not. It is like making estimates, in which we have all had experience. We make an estimate and then we guess at it, and if our guess and our estimate do not agree, we make our estimate over again (laughter) and find where we made an error in our figures. I do not care to employ any mathematical theory. I have gone into that and in a measure tried to forget it and simply to retain the idea of what is right

and what ought to be right. Trautwine says in the beginning of his book that an apparently simple subject can be hidden by a whole lot of mathematical analysis. That is right. But I do not think many people understand what he meant. What he meant was, in my way of thinking, that we are afraid of a mathematical analysis as a general thing, but that if we look at it in a fearless way as we ought to look at the whole study of mathematics, we will find that after all that part of it is the simplest part of the entire problem. I have listened to the various speakers, and, after all, we have based everything that we have done upon the old analytical theory of Rankine. Rankine, in his figures, assumed the slope of earth; said that we had to do that; we had to get some basis for it. Now, once assuming a certain slope of earth, assuming that you have a granular mass that will remain in a quiescent condition under a certain slope, the mathematics of it is very simple, indeed. As Mr. Finley has pointed out, the trouble lies in the fact that we do not always assume the right thing. We have our clay, our sand and our water-soaked soil, and we do not know just at what slope that will stand up.

The formula of $15 h^2$ or $16 h^2$ is based absolutely on the weight of earth from 100 to 107 lbs. and slope of earth of $1\frac{1}{2}$ to 1. If we approach those things without fear and trembling and say we have to make some assumption to guide us we draw up something that looks right and it is probably quite right. I discussed with Mr. Armstrong the diagrams of the solutions made by Mr. Mohler and it struck both of us that while we agreed with his demonstration that for the particular solution involved there was no increase due to surcharge, it simply meant that the surcharge did not affect the top of the wall. When you came down below the surface of the ground, below the top of the wall, then effect of surcharge is noteworthy. If Mr. Mohler will carry out his figures and go down below the surface I think he will agree with us.

E. P. Goodrich, Consulting Engineer (written discussion not received in time to be read at the meeting):—Almost no tests have been made or data secured as to the compressibility, viscosity and elasticity of soils, although an intimate knowledge of these three properties is absolutely essential to a full treatment of earth pressure problems. One illustration of the lack of knowledge on the part of engineers is given by the author in his citation of the celebrated "middle third" proposition and of its frequent erroneous application. It should be considered by every designer that every structure like a building foundation, bridge pier or arch abutment will shift and settle to some extent (often only very slightly) when loads are brought to act upon it, but account is invariably taken of this fact in every well considered design. Most soils exhibit a very appreciable amount of elasticity, which in connection with the compression produced at considerable depths or because of superposed loads, combined to some extent (depending upon the soil) with a sort of viscosity, is what produces the earth pressures concerning which so many theories have been devised from time to time.

Concerning the old theory of Vauban as interpreted by Colomb, Rebhann, Prelini, etc., little need be said beyond the criticisms of the author, except to note the simplicity of the application of the graphical method, which can be adopted even to the case which has been called by the author excessive surcharge, simply by changing the value of γ , every much in the way which is explained by W. S. Hoag, Jr., of the New York Dock Department, in his paper on The Dock Department and the New York Docks contained in the *Proceedings of the Municipal Engineers of the City of New York* for 1905.

Concerning Rankine's theory, it should be observed that he repeatedly states its applicability only to conditions of indefinite extent of top surface (*Civil Engineering*, 1894, ed. pp. 321, 324, etc.); and while the analytical method may be theoretically applicable to every angle of slope of back of wall, still Rankine makes use only of the pressures against a

vertical plane, modifying the location of the center of gravity of the masonry or the weight on the base so as to care for the mass of earth or masonry between the vertical and the back of the wall. With strict adherence to these points, the author's criticisms of the Rankine theory are not justified.

Another point in which the author's theory is as defective as the other theories he mentions is that he makes use in his formulae of the symbol ϕ as applied to the "angle of repose or natural slope" (as do all the others), although later the author discusses the "angle of resistance to flow," which is also mentioned by Rankine as the "angle of repose" "between the portions into which it (a mass of earth) is divided by any plane," each of which terms really correspond with what the writer has called the "angle of internal friction." (See *Earth Pressures and Related Phenomena*, Trans. Am. Soc. C. E., Vol. LIII, 1904, p. 292.) Just so long as inventors of earth pressure theories measure the induced internal stresses in terms of the angle of *surface slope* (however modified), will their theories fail to accord with facts, and the author is believed to be open to this important criticism along with the other authors he criticises.

He has done much valuable work in analyzing the two great earth pressure theories and in collating the results of his analysis, if for no other reason than to show how the several theories are not to be applied. But when it comes to the analysis through which he deduces the conclusion that no more pressure is produced against a wall with vertical back, whether there is a surcharge fill or whether the fill runs "off level or even *sloped down away from the back of the wall*" (the italics are mine), I believe the author to be seriously in error. This conclusion is reached through study of such experiments as those of Darwin (*Minutes of Proceedings, Inst. C. E.*, vol. LXXI., p. 350), Steele (*Engineering News*, Oct. 19, 1899, vol. XLII., p. 261), etc., as well as by the following analysis of conditions assumed much like those in Fig. 3 of the paper. In this survey I shall ignore for the moment the author's statement (which I question) that "the net resultant of the squeeze will be at right angles to the force of gravity . . . whether the wall carries a surcharge or not." (The above quotation is not seriatim from the text of the paper, but is believed, nevertheless, to state the conclusion of the author.)

Assume a pile of cylinders as shown in cross section diagram in Fig. 4. The action of gravity on each is represented by the vertical arrow through the center of each circle, while the small arrows show the points and directions of the pressures exerted on the cylinders beneath. Upon the assumption that the angle of slope of the pile is 60 deg. from the horizontal, it is evident that each little pressure will be transmitted directly through each lower circle without reduction, so that if the final resistance is for the moment considered as acting along 60-deg. lines, as shown in Fig. 5, it is seen that the left-hand arrow in the latter figure must equal three of the small downward arrows in Fig. 4, corresponding to the three left-hand cylinders in the pile, while the next upward arrow in the same direction must equal two and the next only one downward diagonal pressure. Similarly the pressures extended by the left cylinder in the pile shown in Fig. 6 are, as shown therein, to be such that the lateral equilibrating pressures would increase downward according to the series 1, 3, 5, etc., to infinity, provided the top surface is of that extent, but increase only to a constant value in the case of a mass of definite width, such as the contents of a bin. This latter is seen to check with remarkable exactitude with numerous experiments and with the best bin theories. According to Fig. 7, however, when the top slope is at an angle of 60 deg., it is seen that the lateral resisting force at the down-hill side of the slope is equal for all depths when the mass is of limited extent, and the uppermost arrow is much larger than in the case of a horizontal top. On the up-hill side the arrows are seen to increase in length with increase of depth to the same ultimate value as for the other side, but the important

point is found in the fact that the rate of increase is only half that of the condition with horizontal top, viz., 1, 2, 3, 4, 5, etc., against 1, 3, 5, etc. According to the diagram, if the mass is infinite in extent the necessary lateral resisting pressure would theoretically also have to be infinite and equal for all depths. This is perfectly consistent with the conditions of the problem as assumed, because practically all actual natural conditions have been set aside in making the assumptions. Furthermore, it is closely in accord with facts as encountered in cases of large slides where it is practically impossible to construct walls which will resist the earth mass, because in this case the lateral component of the whole weight of the gigantic sliding mass must be resisted. I have experienced several cases of such enormous pressures on the sides of slopes, one example being the crushing of heavy braces placed across a sewer trench only about 3 ft. wide and 6 ft. deep, the ditch having been cut along a side hill composed of damp clay. Intermediate conditions between those of Fig. 6 and the down-hill side of Fig. 7 will give a lateral pressure, increasing with depth and at a rate greater than in the case of a horizontal top. Such a condition may be illustrated as in Fig. 8, where there is seen to be a real increase with depth, but this is seen to be greater than in the case of a horizontal top.

Obviously, in order to secure actual horizontal or other pressures in the diagrams above it is only necessary to revolve the upwardly directed arrows horizontally and vertically; for example, the horizontal component being the one desired, while the vertical component is to be assumed as resisted by the friction against the back of the wall or other proper resisting factor.

Taking up the author's analysis of his Fig. 3, it would seem to the writer that the value of P when deduced in accordance with the author's method could be only of such size as just to equilibrate the single cylinder on which it is applied. This value then would be constant for all depths, however great or small, which is contrary to fact; and for cylinders of infinitesimal size, like grains of sand, the lateral pressure would itself be infinitesimal, which is again contrary to fact.

Moreover, the writer has found by experiment that under certain circumstances in nature almost the exact condition actually exists which the author derides as impossible when he says, "We would have the anomaly of the top of a natural slope of an embankment carrying a load greater than the weight of the material in the vertical projection above." The writer found that with certain kinds of compressible soils the edges (and even more pronouncedly the corners) of a column footing, for example, had to resist several times the earth pressure developed under the center—probably due to the very arch action which the author derides.

It would therefore seem that the author's primary assumptions are wrong except in so far as he has made an endeavor to get at the conditions of so-called "flow," which, however, should be approached from a different standpoint, in my opinion.

It seems to me that the author is entirely wrong in comparing the surcharge greater than the surface angle of repose with a deep-lying soft layer overlaid by strata of heavy materials. A much fairer comparison seems to the writer to be between the actual stratum in question and one in a fill entirely composed of the soft material but of a new depth and surface slope, such that the vertical pressure produced at the stratum in question will be that of a properly selected one in the new assumption. In Fig. 9, for example, suppose a stratum of soft material 10 ft. below the surface, overlaid by material 1.2 as heavy as the soft layer. Obviously, the same conditions, as far as the special layer, are secured by assuming a bank 1.2 as high and all composed of the soft material.

Again, the author's illustration of the bank of clay which will stand with a vertical face for several feet, but will flow



Fig. 4.



Fig. 5.

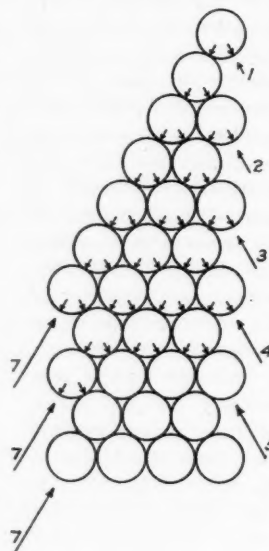


Fig. 7.

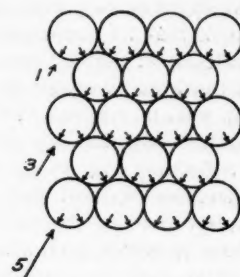


Fig. 6.

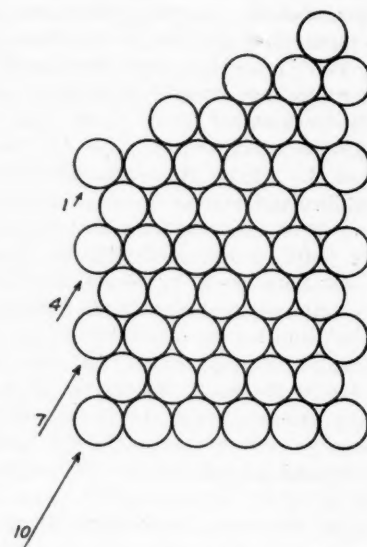


Fig. 8.

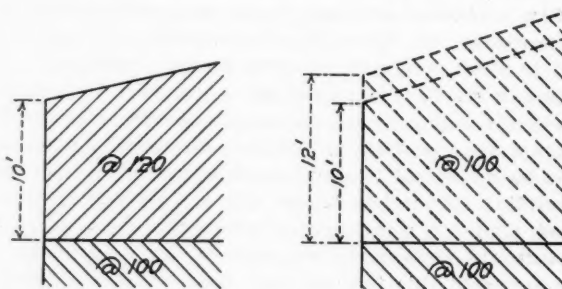


Fig. 9.

at great depths, does not seem at all comparable with a surcharge exceeding the angle of repose, unless it be considered as described in the last paragraph above. It seems to the writer that the true situation is found in the fact that the "angle of internal friction" changes with depth, and this is a condition of which none of the theories—even the author's—take account, unless it be by the device explained above. The writer's experiments on both full-size retaining walls, as well as on models, have led him to the opinion that the resultant of earth pressures is usually located *above* instead of below a point $\frac{2}{3}$ down from the top, as the author states.

Nor do I understand how the accident described by the author at the end of his paper proves anything at all as to the location of the resultant of the pressures which existed. In that case there existed downward, lateral and upward pressures and it was the resistance offered to the last named immediately under the steam shovel which failed.

Finally, after a considerable study, I cannot work out any consistent reason for the formulae used by the author, un-

less the symbol ϕ as used by the author refers to an angle entirely different from that usually understood. It seems quite possible to devise a formula starting from the idea of hydrostatic pressure, but my experiments with clay show that the angle of internal friction alters widely with the depth, so that the symbol ϕ must also vary if the author's theory is to be of any value. Again, it seems as if there should be some means of making a formula which could be applied to walls with back slopes both positive and negative instead of the necessity of using two quite dissimilar formulae as the author has done. In the very fact that two dissimilar formulae are necessary is to be found a marked "break-down" of the author's theory, in my opinion. As stated above, the author has done much service in disclosing the weak points of the existing earth pressure theories, and for that he deserves the thanks of the profession.

OPERATION OF ELECTRIC AND MALLET LOCOMOTIVES ON THE GREAT NORTHERN.

The operating conditions of the Cascade tunnel line of the Great Northern were described in the *Railway Age Gazette* of December 3 and December 24, 1909. In a paper before the American Institute of Electrical Engineers, Cary T. Hutchinson, the electrical engineer of the line, gave some additional data regarding the performance of the electric and Mallet locomotives on this line.

Electric service was started on July 10, although one or two trains had been handled previously. From that time to August 11, practically the entire eastbound service of the company was handled by electric locomotives.

During this period of 33 days there have been 212 train movements, of which 82 were freight, 98 passenger and 32 special. In each case the steam locomotive was hauled through with the train. The tonnage handled was as follows:

	Tons.
Freight tonnage	171,000
Passenger tonnage	88,500
Special tonnage	15,500
Total	275,000

This is an average of 8,350 tons a day, all eastbound. The average freight train weight has been as follows:

	Tons.
Cars	1,480
One Mallet locomotive	250
Three electric locomotives	345
Total train weight	2,075

The maximum weight of cars was 1,600 tons; the minimum 1,200 tons.

The representative passenger train handled is made up as follows:

	Tons.
Coaches	426
One steam locomotive	250
Two electric locomotives	230
Total train weight	906

The maximum was about 125 tons greater.

The power required to haul these trains seemed greater than it should be; investigation showed that the difference was accounted for by the unexpectedly high friction resistance of the steam locomotives, as a trailing load; tests were made on several engines with the following results:

Test No.	Engine classification.	Total weight with tender. Tons.	Weight on drivers. Tons.	Resistance on 1.7 per cent. grade. Lbs.	Equivalent weight of freight cars. Tons.
1	Mallet No. 1904, 2-6-6-2..	250	158	19,340	482
2	" No. 1911, 2-6-6-2..	250	158	17,500	432
3	" No. 1905, 2-6-6-2..	250	158	24,200	602
4	Consolidation .. 2-8-0 ..	159	90	10,080	255
5	Pacific	188	70	10,270	257

The tests were made by towing an engine through the tunnel behind an electric; the electric was fitted up with test instru-

ments and the total tractive effort was thereby obtained. An allowance of 6 lbs. per ton was made for the resistance of the electric and the difference is the draw-bar pull in column 5. Column 6 is the equivalent load in cars, taking car resistance as 6 lbs. per ton. Each test given is the average from six to twelve separate readings. The average for the three Mallets is more than 20,000 lbs.

If the grade resistance be deducted from the total pull, and the difference lumped as "lbs. per ton" for the locomotive and tender, there results:

TABLE IV.

Engine classification.	Frictional resistance of locomotive. Lbs.	Lbs. per ton.
Mallet No. 1904	10,840	43.0
Mallet No. 1911	9,000	36.0
Mallet No. 1905	15,700	63.0
Consolidation	5,480	34.5
Pacific	3,870	20.7
Electric	1,500	13.0

The average for the three Mallets is 47.0 lbs. per ton for the frictional resistance on a straight level track.

The figure for the electric was obtained from tests made by towing it by a motor car on straight level track; this test was made at Schenectady. Included in it is the resistance of gears and bearings of motors.

Using 20,000 lbs. as the pull required for a Mallet on the 1.7 per cent. grade, the approximate average from the table, the total tractive effort for the average freight train is:

Cars	1480 tons \times 40 = 59,200 lbs.
One Mallet	250 tons \times 80 = 20,000 lbs.
Three Electrics	345 tons \times 40 = 13,800 lbs.
Total tractive effort	93,000 lbs.

This is equal to 31,000 lbs. for each electric locomotive.

On account of the very high frictional resistance of the Mallet engine as a towing load, this representative train is equivalent to 1980 tons, excluding the three electric locomotives, or a total of 2,325 tons, on the 1.7 per cent. grade. This is on the assumption that the draw-bar pull required for the Mallet is replaced by freight cars at 6 lbs. to the ton; this represents the average freight train handled.

The tractive effort for the passenger train varies from 40,000 to 50,000 lbs., depending on the number of steam locomotives taken through; two electrics are ordinarily used, although one would answer in nearly all cases.

During this period there have been no delays due to failure of the electric locomotives, and but two trifling delays due to failures of the electric plant, both chargeable to the transmission line and both caused by accidents beyond the control of the operating force.

On August 11 the electric service was discontinued, owing to failure of both water wheels. Service was resumed on September 9 and has been continued regularly since. The plant was taken over by the operating department of the railway late in September.

The westbound service was not at first handled by the electrics regularly, as there is nothing in particular gained by braking the trains electrically on this short stretch, but now westbound passenger trains are so handled, for the benefit of the passengers.

A number of tests have been made to determine the power returned when regenerating; the following is typical:

TRAIN: MALLET ENGINE, 1,550 TONS, CAR WEIGHT, TWO ELECTRICS ON 1.7 PER CENT. GRADE.

Force due to grade.	Frictional Resistance.	Remainder for acceleration.
Mallet	8,500 lbs.	11,500 lbs.
1,550 tons in cars	52,500 "	9,300 "
Three electrics	11,770 "	2,070 "
Total for acceleration		49,830 lbs.

This is equivalent to 1,495 k.w. delivered to the gears of the motors at 15 miles per hour.

The efficiency of the locomotive is approximately 80 per cent., hence the power returned to the line should be 1,200 k.w. The test of this train gave 950 k.w.; the difference is due to the standard practice, not yet abandoned, of keeping a certain number of car pressure retainers set on down grade. The Mallet, instead of adding to the delivered power, is an additional load that has to be carried by the train.

A similar test on a ten-car passenger train weighing 950 tons gave:

Delivered power, calculated	590 k.w.
Delivered power, measured	597 k.w.

In this case there was no added resistance of pressure retainers.

These tests merely confirm the calculations, as they should. On a 1.7 per cent. grade, then, the ton, descending at 15 miles per hour, will deliver 0.67 k.w. to the system; on a 2.2 per cent. grade it will deliver 0.91 k.w.

The losses in the system when delivering 4,000 k.w. to the locomotive, at the west end of the Wellington yard, are:

Place.	Power	
	Kilowatts.	Per cent.
Powerhouse low tension bus-bars.....	4,740	100
Sub-station low tension bus-bars.....	4,250	89.8
Trolley wheel of the locomotive.....	4,000	84.5
Driving axles of the locomotive.....	3,320	70

The average efficiency is somewhat higher than 70 per cent.

The maximum duty was imposed upon this equipment from the outset. On account of very poor regulation of water wheels, steam has been used in one of the Mallet engines in starting the freight trains in the Wellington yard; an attempt has been made to use just sufficient steam to enable the Mallet engine to turn itself over. Steam is shut off at the portal of the tunnel; in addition to this, in order to provide smoother starting, a slight air pressure has been maintained on the locomotive at starting, which is gradually reduced.

On several occasions trains have broken in two, due to the trolley wheel on the rear locomotive leaving the wire and thus cutting off part or all of the power supply to the rear locomotives. This throws a greatly increased draw-bar pull on the front locomotive, and the consequence is that the train is jerked apart. This happened in the early stages of the work, and was due to the fact that the turn-outs were not in the best order, and also that the enginemen had not sufficient experience in handling trains. Another means taken to avoid the broken draw-bars was to use the rear Mallet engine to assist the train over the trolley crossings in the Wellington yard; this was a temporary measure and has been discontinued.

It is interesting to compare the performance of a Mallet locomotive under the same operating conditions as this system. The data for this are given by Mr. Emerson, superintendent of locomotive power of the Great Northern, in a discussion before the American Society of Mechanical Engineers on locomotives of this type. As an excellent performance, he gives these figures:

"Recent performances show that on a round trip over this division the L-1 engines handled 1,600 tons with a total of 43 5/6 tons of coal, or equivalent to 25.13 lbs. of coal per 100 ton-mile."

The division referred to is from Leavenworth to Everett, 108.7 miles. The work done per ton for a round trip over this run is readily calculated; from the profile I find,

Total rise, westbound	2,212 ft.
" " eastbound	3,440 ft.
Total	5,652 ft.

and $5,652 \times 2,000 / 2.65 \times 10^6 = 4.26$ k.w.-hrs., at the rail; this is the work done per ton in lifting the train; the work done against train resistance, assuming resistance to be 6 lbs. to the ton, for 108.7 miles, is 1.3 k.w.-hrs.; the total work done in round trip per ton 5.56 k.w.-hrs. There should be a negligible addition to this for starting the train.

The average train weight is:

Cars	1,600 tons
One engine, 109 miles.	
Second engine, 58 miles.	
Equivalent engine weight	380 tons
Total	1,980 tons

The coal used was 43 5/6 tons, equal to 87,660 lbs.

Coal per ton	44.3 lbs.
Coal per kilowatt-hour	8.0 lbs.

A modern steam station can deliver one kilowatt hour for 3 lbs. of coal, at the bus-bar, which, with an efficiency of 70 per cent. to the rail, gives a consumption of 4.28 lbs. per kilowatt-hour at the rail; in other words, the Mallet requires nearly twice as much coal per kilowatt-hour at the rail as would be used in a modern steam station in the place of the hydro-electric station at Leavenworth.

PENNSYLVANIA RAILROAD STATION AT NEW YORK.

The plans for the new Pennsylvania Railroad station in New York City were fully shown in the *Railroad Gazette* of February 9, 1906, and May 25, 1906. Later articles appeared in the *Railroad Age Gazette* of March 19, 1909, and August 20, 1909.

The main entrance is on Seventh avenue, between Thirty-first and Thirty-third streets. The tracks are 40 ft. below the street surface and the station is divided into three levels. The Seventh avenue entrance is for foot passengers only. It leads to the main waiting room through an arcade 225 ft. long and 45 ft. wide, flanked on both sides by shops and booths. At the farther end of the arcade are the restaurant, lunch rooms and cafe and beyond is the general waiting room and concourse.

On the first level below the street is the station proper. The general waiting room is 277 ft. x 103 ft. and is 150 ft. high. On the same level with the general waiting room is the main baggage room, with 450 ft. frontage. This is for the use of the transfer wagons and covers the full area occupied by the arcade and restaurants on the floor above. Baggage is delivered and taken away through a special subway. From the baggage room trunks are delivered to the tracks below by motor trucks and elevators. Motor cabs will also be stationed on this level.

Parallel to and connecting with the main waiting room by a wide thoroughfare is the concourse, over 200 ft. wide, extending the entire width of the station and under the adjoining streets. Stairs descend from it to each of the train platforms on the track level. The concourse and adjacent areas are open to the tracks, forming a courtyard 340 ft. x 210 ft., roofed by a lofty train shed of iron and glass. In addition to the entrances to the concourse from the waiting room there are also direct approaches from the streets.

Auxiliary to the main concourse and between it and the tracks is a sub-concourse 60 ft. wide, which will be used for exit only. This exit concourse is 18 ft. above the tracks, but is connected with the track level by two stairways and one elevator from each platform. From it ample staircases and inclines lead directly to the street.

The northern side of the station, extending along Thirty-third street, is assigned to the Long Island Railroad. Into this part of the station trains will run from all points on Long Island by way of the East river tunnels. Ample entrances and exits are provided, so that this traffic can be handled independently. The third level is the train platform, about 36 ft. below the surface of the street.

The building covers the entire area bounded by Seventh and Eighth avenues and Thirty-first and Thirty-third streets, being 788 ft. x 430 ft. The main part of the building reaches 76 ft. above the street level. With entrances through each of the two corners of the station on Seventh avenue there are carriage drives, each about 63 ft. wide. The frontages on Thirty-first and Thirty-third streets are similar.



Waiting Room.

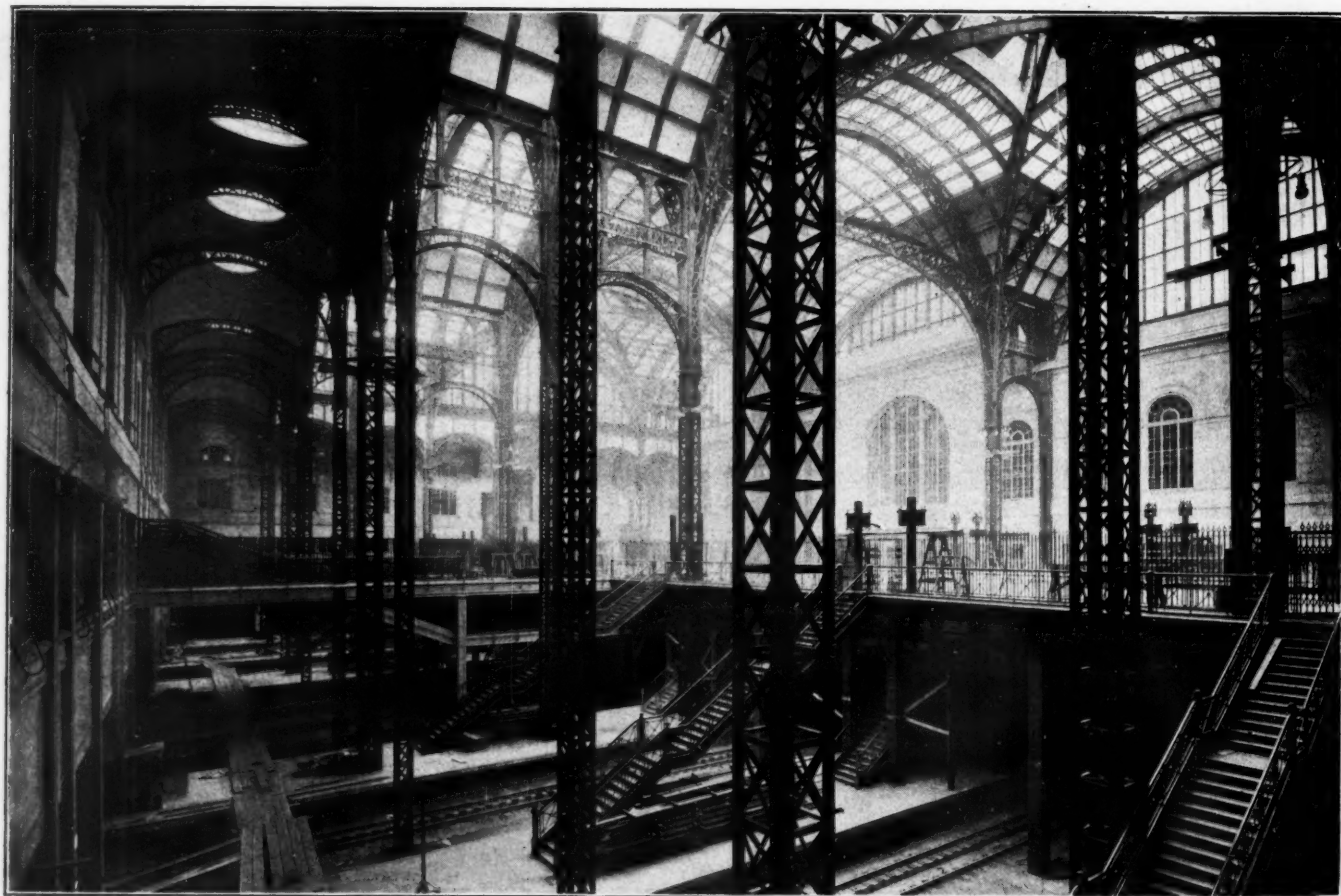


Pennsylvania Station at New York.

Looking southwest over the corner of Seventh avenue and Thirty-third street.



Concourse of Pennsylvania Station.



Track Level and Concourse.

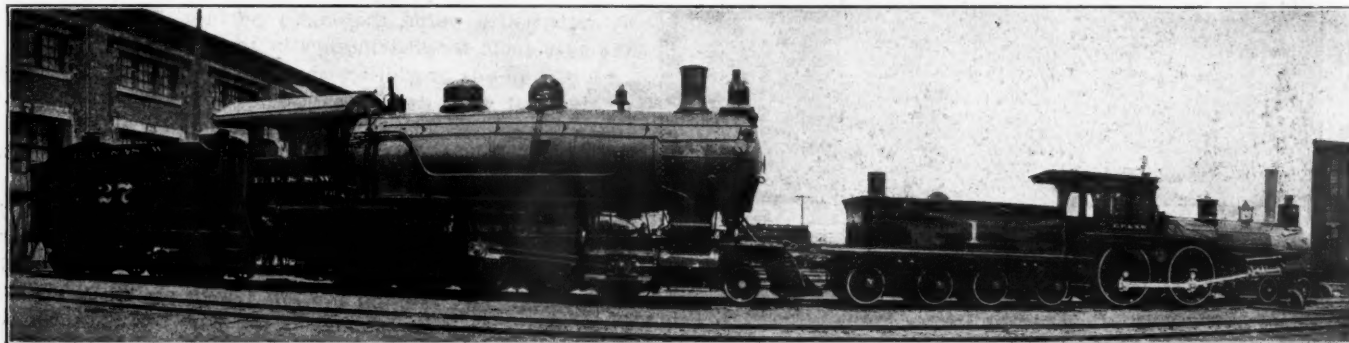
The following figures as to the track facilities, etc., are of interest:

Area, Tenth avenue to normal tunnel section east of Seventh avenue	28 acres
Length of trackage	16 miles
Number of standing tracks at station	21
Length of platforms adjacent to passenger trains ..	21,500 ft.
Number of passenger platforms	11
Highest point of tracks—below sea level (M. H. W.) ..	9 ft.
Number of baggage and express lifts	25
Total excavation required	3,000,000 cu. yds.
Length of retaining walls	7,800 ft.
Number of lineal feet of streets and avenues carried on bridging	4,400, or an area of about 8 acres.
Loading per square foot on avenue bridging	1 3/4 tons
Maximum loading per square foot on bridging east of Seventh avenue	5 tons
Maximum capacity of all tunnels, in trains per hour ..	144
Storage capacity of station yard tracks	386 cars
Proposed initial daily service of P. R. R. trains ..	400
Proposed initial daily service of L. I. R. R. trains ..	600
	1,000 trains

PROGRESS IN LOCOMOTIVE CONSTRUCTION.

The locomotives shown in the accompanying half-tone give an idea of the progress in locomotive building during a period of 45 years. Engine No. 1 was built by Breese, Kneeland & Co. in 1857, and the modern decapod, No. 27, was built by the Baldwin Locomotive Works in 1903.

Engine No. 1 is at the present time standing on a section of slag-ballasted track in a park which adjoins the general office building of the El Paso & Southwestern, at El Paso, Tex. Previous to its service on this road the locomotive belonged to the Milwaukee & Mississippi, and after this road became a part of the Chicago, Milwaukee & St. Paul, the



Decapod Locomotive of 1903 and American Type of 1857.

engine's number was changed to 111. The original engine was designed for wood burning and had a large stack. The extended front end and straight stack were applied some time during the seventies, after the engine was acquired by the Chicago, Milwaukee & St. Paul and converted into a coal burner. These facts indicate that this engine is an early example of front end improvement. These changes are probably the only radical ones which were made from the original design.

The following are the general dimensions of the two locomotives:

Type	4-4-0	2-10-0
Weight on drivers	36,000 lbs.	200,000 lbs.
" on trucks	16,000 "	20,000 "
" total	52,000 "	220,000 "
Total w't. eng. and tender ..	104,166 "	390,000 "
Firebox, length	49 in.	114 in.
Firebox, width	35 in.	66 in.
Tubes, number	125	410
" length	11 ft. 0 in.	16 ft. 8 in.
" diameter	2 in.	2 1/4 in.
" heating surface ..	715 sq. ft.	4,003 sq. ft.
Firebox, heating surface ..	77.6 "	150 "
Total heating surface ..	792.6 "	4,153 "
Graze area	11.91 "	52.2 "
Boller pressure	110 lbs.	190 lbs.
" diameter, front ..	42.5 in.	80 in.
Water capacity	1,700 gals.	7,500 gals.
Coal capacity	6 tons.	14 tons.
Tractive effort	9,000 lbs.	46,904 lbs.

NEW PRIVATE CAR FOR THE QUEEN OF ENGLAND.

BY C. VAN LANGENDONCK.

Herewith is illustrated a new private car recently built for the use of the Queen of England and Princess Victoria.

The car is 67 ft. long, 9 ft. wide, and 12 ft. 9 in. high from the rail level to the top of the roof, and is carried on two six-wheel trucks.

The body is built of teak, finished with selected Java panels, also of teak, the center panel bearing the royal coat of arms. The roof is elliptical. Entrance to the platforms at either end is obtained from double doors opening inward, the outside panels of which are embellished with gilt brass moldings and mounted with Her Majesty's cypher. On each side of the doors ornamental grip handles finished in gilt extend from the floor to the cornice.

The arrangement of the saloon is as follows:

The Queen's day saloon.

The Queen's dining saloon, convertible to sleeping saloon for night traveling by insertion of portable partition.

The Queen's dressing room.

Two lavatories.

Princess Victoria's dressing room.

Princess Victoria's sleeping saloon.

Attendants' end and platform.

This arrangement provides two complete and separate suites of rooms.

The interior of the day saloon is paneled from floor to ceiling and enriched with special moldings and cornices, the whole being enameled white with half-gloss finish. The ceiling is enriched with moldings and finished flat ivory white.

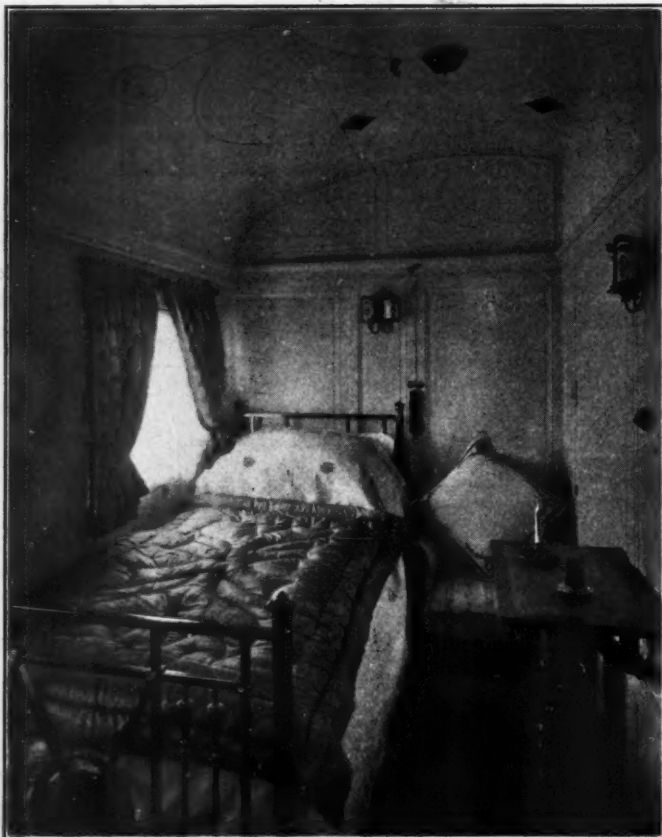
The furniture is of inlaid hardwood, upholstered in pale flowered silk. The metallic fittings are finished in mercury gilt. The artificial lighting of the saloon is obtained by the reflection from the ceiling of electric lino lights concealed behind the window cornice at either side of the saloon, and supplemented by two-light electric brackets of artistic design fixed at intervals below the cornice, and covered with silk hand-painted shades. The floor is covered with a thick red wilton pile carpet.

The walls and ceiling of the dining saloon are finished as in the day saloon. The furniture is of inlaid satinwood upholstered in striped silk. The floor is covered with a red wilton pile carpet, and the fittings are of mercury gilt. The artificial lighting is effected by means of three-light table standards in which electric candle lamps are used, supplemented by two-light electric brackets attached to the walls at suitable intervals.

When used as a sleeping saloon for night service the day service furniture is removed and replaced by a brass bedstead and other suitable furniture, and a portable section of paneling fitted to form a corridor between the day saloon and retiring rooms, the paneling being finished to match the other walls of the saloon.

The walls and ceiling of the Queen's dressing apartment are finished in white, as previously described. The furniture is of inlaid satinwood, and includes dressing table with large mirror and drawers below, the top being laid with figured silk covered by beveled plate glass, washstand with marble top, and porcelain basin, clothes stand and dressing chair.

Princess Victoria's dressing and sleeping rooms are paneled



Princess Victoria's Bedroom.

and finished in white to match those in the Queen's suite. The furniture is of inlaid satinwood upholstered in pale flowered silk, and the floors are covered with a gray wilton pile carpet.

The two lavatories are paneled and molded in plain pencil cedar and the ceilings finished white. The floors are covered with cork parquet.

The platform is paneled and molded in Java teak, and the ceiling finished white and enriched with moldings.

The platform at the attendants' end is treated in the same manner and is fitted with a chair upholstered in red leather. In this compartment the whole of the mechanism for the

control of the lighting, heating and ventilation is contained. A telephone, communicating with all the vehicles forming the train, is installed here, as well as an electric bell indicator communicating from each of the royal apartments.

The corridor is paneled and molded throughout with Java teak from floor to ceiling, and the ceiling finished flat, ivory white, and enriched with moldings and carton pierre ornaments. The floor is covered with India rubber, inlaid tile pattern, to prevent noise when moving along the corridor, the same material being used on the floor of the attendant's compartment.

The windows throughout the carriage are easily opened or closed. They are fitted with spring blinds of green silk, draped with white taffeta curtains on rods, and overhung with silk curtains, those in the day saloon being finished with embroidered pelmets, which in combination with the light artistic fittings lend an elegant appearance to the interior, as well as the exterior of the vehicle.

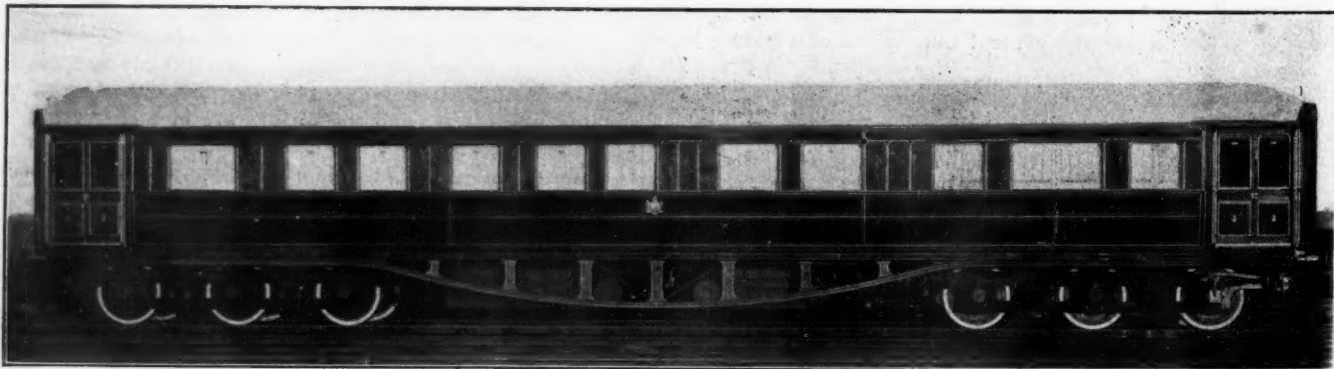
The car carries a complete electric installation to deal with the lighting and ventilation, consisting of two dynamos working in parallel coupled to two sets of accumulators, also in parallel. The aggregate candle-power of the lamps mounts to 1,120.

A complete system of ventilation, electrically operated, has been adopted throughout the carriage, and worked in conjunction with means for heating and cooling each or any of the apartments. The air ducts, secreted between the roof boards and the interior ceiling finish, are led the full length of the carriage. An air intake cowl projects through the carriage roof and is coupled to two electric motors and fans fixed in a false roof above the attendants' compartment. The air is drawn through a purifying tank consisting of fiber matting saturated with water, thoroughly purified, and delivered into the two ducts for distribution in the various compartments, each of which is provided with air inlets, which can be opened or closed at will. In its passage to the ducts arrangement is made for heating the air by a steam coil in winter time. A delicate perfume is also imparted to the air obtained by packing the top of the purifying tank with kuskus root.

For the purpose of keeping the temperature under perfect control and extracting any impure air, an exhaust electric motor and fan is placed under the carriage body coupled to an exhaust duct running the full length of the carriage and secreted in the same manner as the pure air ducts, and controlled by outlet grids, which can be opened and shut as required.

In addition to the complete electric installation described the car is arranged with a 50-volt circuit fed from a van at the end of the royal train. This is used to supply a number of portable electric radiators disposed in the various compartments and also for heating the provided kettles and urn.

The car is fitted with vacuum and Westinghouse brakes, Pullman vestibules, and Buckeye automatic couplers. The weight in running order is 44 tons.



The Queen's Car.

General News Section.

The New Jersey legislature has refused to renew the appropriation for the board of three experts which has been engaged in a valuation of the railways of the State, but has authorized the State Board of Assessors to continue the work by appointing one of the three experts, who will engage assistants as may be found necessary.

James J. Hill has assured the Governor and the Railway Commission of Washington that immediate steps will be taken to avoid future trouble with snowslides on the line of the Great Northern. The points at which the disastrous slides of the past winter occurred were thought to be safe, but these and other points not already adequately protected will be covered with sheds at once.

Near New Lisbon, Wis., on the morning of April 8, on the Pioneer Limited Express of the Chicago, Milwaukee & St. Paul, two masked men held up Conductor A. P. Shumway with pistols, intending evidently to rob the passengers; but the conductor, instead of holding up his hands, leaped upon the larger of the two bandits and, with the aid of a sleeping car porter, repulsed them; but they applied the air-brakes, stopped the train and escaped.

On the passenger trains of the Lehigh Valley the trainmen, porters and waiters have been instructed to tell any passenger who may be noticed looking out of a window the name of the place or building which has attracted his attention.

Seventy local passenger agents and ticket sellers of the Lehigh Valley have been taken to New York City to inspect the Hudson river tunnels; this for the purpose of enabling these men to give intelligent answers to questions asked by passengers.

On behalf of the Illinois Central, R. E. Gaut, engineer of bridges and buildings, has offered to the city of St. Louis land for crossings and approaches for the city's proposed free bridge across the Mississippi river. The land offered amounts to more than one-half an acre, and it is stated that to condemn it might have cost the city from \$10,000 to \$50,000. St. Louis newspapers say that the Southern Railway has offered the city seven acres, which it will need for the free bridge, for about \$80,000.

The New York State Superintendent of Public Works has awarded Barge Canal Contract No. 90 to the D'Olier Engineering Company of Philadelphia, Pa., for \$178,197. It is for furnishing and installing electrical equipment for lighting and operating locks on the Erie, Champlain and Oswego canals, at Baldwinsville, Smith's Basin, Comstocks, Whitehall, Phoenix and Oswego. The superintendent also has awarded a contract for the construction of a dyke along the Oswego River for 1¼ miles, near Fulton, to Cunningham & Woodard, of Hudson Falls, for \$47,721.

The Mayor of New York City has announced informally that the tunnel under the East river from the Borough of Queens to Lexington avenue and Forty-second street, Manhattan, which was completed more than two years ago, is to be put in use. The intimation is that the Interborough Rapid Transit Company, which is in control of the tunnel, will extend it westward from Lexington avenue, through Forty-second street to Broadway, and then run trains direct to Broadway. An extension of this tunnel westward would have to go below the level of the present north and south subway, which runs through Forty-second street for most of the distance between the two points named.

On the eight or ten preference freight trains running over the Philadelphia division of the Pennsylvania, each engineman now has his own engine; that is to say, an engine is assigned to each crew, and it stands idle while the men of that crew are sleeping. This action has not been extended to the slow freight trains. On the middle division the officers have been experimenting with this matter for some time, and it is believed that the order will shortly be extended to the preference freight crews over the entire road. In the passenger service two crews are assigned to one engine, and the plan works very

satisfactorily in the main. For some time the middle division slow freight crews have been having their own engines.

J. S. B. Thompson, assistant to the president of the Southern Railway, whose office is at Atlanta, has engaged Lauren Foreman, hitherto city editor of the *Atlanta Constitution*, as director of the publicity department of his work. Mr. Thompson, under the direction of President Finley, is enlarging the activities of the road in connection with the promotion of industrial and farming interests throughout the southern states, and not only will new settlers and new industries be attracted to the region by every means possible, but the dissemination of information in all districts served by the railway will be attended to with special care and with a constant endeavor to develop the territory in the best possible manner.

The Chicago & North Western and the Bessemer & Lake Erie have issued orders that the movement of freights on Sundays must be reduced as completely as possible. The Bessemer & Lake Erie is owned by the United States Steel Corporation, which has ordered the discontinuance of Sunday work so far as possible in all of its mills. It is said that in the Pittsburgh district 13,000 men in the steel mills have hitherto worked seven days (or nights) in each week. Besides the Bessemer & Lake Erie, the United States Steel Corporation controls a number of other railways, on all of which the Sabbath-keeping rule will be put in force. The principal roads in this list are the Duluth & Iron Range, the Duluth, Mesaba & Northern and the Elgin, Joliet & Eastern.

The pension department of the Pennsylvania Railroad, including the lines west of Pittsburgh, last year paid out the sum of \$786,345 in pension allowances to 3,465 retired employees. The appropriations for pensions made by the different companies of the system amounted to \$882,500. The total number of employees on December 31 was 181,987, of which 123,628 were on the lines east of Pittsburgh and Erie, and 58,359 on the lines west of Pittsburgh. A statement of the pension payments of twelve of the leading roads of the country in the fiscal year ending June 30, 1907, shows that, with some 303,000 employees, 1,765 of whom were retired, the total payments of these roads amounted to \$358,519, or less than half of the total payments of the Pennsylvania the past year. The average pension paid by the Pennsylvania last year was \$254.57, while the average paid on the twelve other principal railways in the year ending June 30, 1907, was \$203.

The Pennsylvania Railroad is now using signal instruction cars on all divisions. The new cars in use on the main line are 60 feet long, divided into two compartments. One room will be used for examinations, while the other will contain a table upon which is to be placed under a glass cover a large track chart of the railway, which can be rolled back and forth by means of rollers placed at each end. This chart shows all main running tracks, switches and cross-overs; all signals, track troughs, stations and mile posts. The men will be given an opportunity to study this chart prior to passing an examination on it. Each car is provided with a set of model signals, which can be manipulated so as to show all signal indications. The cars are in charge of examiners, each of whom has an assistant. These men will have charge of all examinations, except those on machinery and air brakes. The cars will also be used for examination of employees on train rules and other subjects.

According to the *Deseret News* of Salt Lake City, the track of the Western Pacific across the southern end of the Great Salt Lake, which for eight miles is on a trestle or earth embankment in the water, has been so much damaged by high water recently that there has been some thought of running around the lake farther south, by using the track of the San Pedro, Los Angeles & Salt Lake; but to do this, about ten miles of new line would have to be built to make a suitable connection with the Western Pacific west of the lake. It seems to be assumed that the lake is rising at the rate of 2 ft. a year. The Lucin cut-off of the Southern Pacific, across the northern

part of the lake, was badly damaged in the last week in March, and for several days through trains had to run around by the old line through Kelton, which is about 44 miles longer than the cut-off line. This old line has not been kept in good condition, and trains had to be run very slowly. It is now proposed to relay the track with heavy rails and to put the road-bed in good condition.

Proposed Public Utility Legislation for Ohio.

The Ohio members of the Railway Business Association attended a hearing before a committee of the Ohio legislature at Columbus on the evening of April 12 to oppose the enactment of a number of provisions in the Wood bill, which proposes to create a public utilities commission by changing the name and enlarging the powers of the present state railway commission. The provisions of this measure are so drastic and sweeping that if it were passed it would practically place the administration of all the railways and other public utilities entirely in the hands of the proposed public utilities commission.

By section 501-2 "the commission is vested with the power and jurisdiction to supervise and regulate every public utility in this state and to do all things necessary and convenient in the exercise of such power and jurisdiction."

Section 508 provides that no change shall hereafter be made by any public utility in any of its classifications or charges except after 30 days' notice to the commission and with its approval. The commission may allow a reduction of rates within a less time.

In sections 524, 526, 527 and 528 the commission is given power, on complaint by any person or on its own motion, to investigate the reasonableness of any charge made by any public utility in the state, and, after investigation, to make whatever rate, regulation or classification it shall have determined to be just and reasonable, and the charge fixed by it must be imposed in the future. In other words, it is given the power to fix not merely maximum rates but absolute rates.

Section 541 provides that all orders, etc., of the commission shall be in force and prima facie lawful from the date they take effect, unless or until changed by the commission or the courts.

Section 583-6 makes it unlawful, unless the commission shall otherwise order, for any public utility to receive a greater compensation for any service than the lowest charge fixed for that service on January 1, 1910.

Section 602-5 gives the commission authority to examine and audit all accounts of all public utilities and to prescribe all the details of their accounting. All accounts must be closed annually on June 30, and on or before the August 1 following a copy of the balance sheet must be furnished to the commission.

Section 602-6 requires each public utility "to carry a proper and adequate depreciation account whenever the commission after investigation" shall so order, and empowers the commission to "ascertain and determine what are the proper and adequate rates of depreciation of the several classes of property of each public utility. The rates shall be such as will provide the amounts required over and above the expenses of maintenance to keep such property in a state of efficiency corresponding to the state of the industry."

Section 602-7 provides that "all moneys thus provided for shall be set aside out of the earnings and carried in a depreciation fund. The moneys in this fund may be expended in new construction, extensions or additions to the property of such public utility, or invested, and if invested, the income from the investments shall also be carried in the depreciation fund. This fund and the proceeds thereof shall be used for no other purpose than is provided in this section for depreciation and only as allowed by the commission."

Section 602-26 prohibits any public utility, domestic or foreign, to in future acquire, take or hold any part of the capital stock, bonds, notes, or other evidences of indebtedness of any public utility unless authorized so to do by the commission.

Section 602-27 provides that no corporation of any kind shall acquire or hold under any circumstances more than 25 per cent. of the total capital stock issued by any public utility, except where such stock is transferred or held for the purpose

only of collateral security, "and in such case only with the consent of the commission." Nothing in the act shall be construed to prevent the holding of stock heretofore lawfully acquired. Every act in violation of this section shall be void.

Under section 602-28, in case of the consolidation of two or more public utilities the aggregate amount of the capital stock and the aggregate amount of the debt of the consolidated companies shall not by reason of such consolidation be increased.

Negotiations Concerning Wages.

The Boston & Maine, after a 10 days' conference, has agreed with its conductors and brakemen on an increase of wages. The rates as given in a published account are as below, the average increase being, it is said, 11 per cent. The settlement provides that the standard for a day's work shall be 10 hours. Passenger conductors are to receive 2.68 cents a mile, ticket collectors 2.15 cents a mile, baggagemen 1.55 cents a mile, and brakemen on passenger trains 1.5 cents a mile. The rate per mile for through freight crews is: Conductors 3.63 cents; flagmen, 2.525 cents; brakemen, 2.42 cents. Yard conductors, days, 34, 33 and 32 cents, according to their rating; yard conductors, nights, 36, 35 and 34 cents an hour. Day yard brakemen receive 31, 30 and 29 cents an hour, and night yard brakemen 33, 32 and 31 cents. The rates in road service are the same as those of the Baltimore & Ohio and the New York, New Haven & Hartford. Local freight trainmen are to have higher rates than through freight trainmen. The rates for yard men seem to be lower than those of the B. & O., the first or highest grade on the B. & M. being the same as the second grade on the B. & O.

Officers of the New York Central have agreed with committees of the conductors and the brakemen of the company to arbitration of the question of wages of these classes of employees, which question has been under discussion for several weeks. President Brown, of the company, submitted a number of propositions for arbitration, one of which was to call in Messrs. Knapp and Neill under the Erdman act, but the proposition finally accepted by the representatives of the employees was that the question be submitted to E. E. Clark, Interstate Commerce Commissioner, and P. H. Morrissey, president of the American Railway Employees' and Investors' Association; these two, if unable to agree, to select an umpire, whose decision shall be final and binding. Mr. Clark was formerly chief of the conductors' brotherhood, and Mr. Morrissey was formerly chief of the brakemen.

An officer of the New York Central, discussing the increase of wages which has been asked for by the conductors, says that on the Baltimore & Ohio, which has granted a higher rate than the New York Central is willing to grant, the conductors earn less per month than on the New York Central. Passenger conductors on the New York Central now earn \$144 a month; the company is willing to increase the rate so as to make the average earnings \$176 a month, while the rate demanded by the conductors would produce \$205 a month. This officer says:

"The B. & O., under the new arrangement, pays but six of its conductors \$169 per month, and these are the highest paid men in the company's employ. They make 22 trips each month to earn this amount. Under the schedule which the New York Central offers, 66 men, going out 18 times per month, would each earn \$176 per month. While the mileage of the New York Central men is greater than that on the B. & O., the superior equipment allows them to make four trips less than on the B. & O. and still earn a greater amount of money." By superior equipment this officer refers to the complete signaling, the four-track lines and the high speeds and few stops, which simplify the work of the conductors. At \$176 a month, conductors will earn \$2,100 a year, or about \$1 an hour. Nine years ago conductors received only \$1,500 a year.

Committees of employees of the Lake Shore & Michigan Southern, the Michigan Central and other lines controlled by the New York Central have been presenting requests to the officers of the several roads, but a settlement of the matter on these roads seems to be likely to be postponed until after the announcement of the results of the arbitration on the New York Central proper.

The New York Central has increased the pay of its telegraphers about 7 per cent.

The Pittsburgh & Lake Erie has increased the wages of conductors and brakemen about 7 per cent.

Grievance committees representing conductors and brakemen of the Pennsylvania are asking for a greater increase than that (of 6 per cent.) which the company has just granted.

The Wabash has agreed with representatives of its conductors and trainmen to pay these classes the same rates of wages which may be established in eastern territory—meaning, presumably, the rates of the Baltimore & Ohio.

The Norfolk & Western has made an increase of about 6 per cent. in the pay of men in the maintenance of way department.

The Baltimore & Ohio Southwestern has increased the pay of mechanics in its shops one cent an hour, and of unskilled workmen in the shops five mills an hour.

On the Pennsylvania Railroad at Harrisburg, Pa., and presumably at other yards of the same class, the rates of pay for yard men are given as follows: Yard conductors working days, 35½ cents an hour; night, 1 cent an hour more. Day brakemen, 30 cents an hour, and night brakemen, 32 cents. Enginemen on H-6 engines, day or night, first class, 43.5 cents; second class, 40.7 cents. Other enginemen, day or night, first class, 40.6 cents an hour; second class, 37.8 cents. Firemen, day or night, on H-6 engines, 23.1 cents, and on others, 25.2 cents.

The New York, New Haven & Hartford has reduced the working time in its shops from 48 hours a week to 40.

The Seaboard Air Line has increased the pay of locomotive enginemen 6 per cent., following negotiations which have been carried on for the past three weeks.

Disastrous Collision in Germany.

In a rear collision at Mulheim, on the Rhine, March 30th, 22 passengers were killed and 200 injured, all of the victims being soldiers returning to their posts from Easter vacations. Two signalmen were arrested.

Improvement Work on the Rock Island Lines.

The improvement work which has been under way on the Rock Island Lines for some years will be continued during this year. Ballasting and widening of track will be done on a large scale, about \$1,100,000 being spent for this purpose. Approximately 500 miles will be rebalasted. Special attention will first be given to the line between Chicago and Denver and Colorado Springs, on which about 200 miles will be rebalasted or resurfaced, as conditions demand. One of the divisions which will be resurfaced and strengthened is the Illinois division. The work here will proceed as fast as the new 100-lb. rails which have been bought for it are laid. The rest of this kind of work will be done in Kansas, Oklahoma and Arkansas, preference being given to those parts of the lines where the demands of traffic are greatest. Rock, disintegrated granite, burnt clay and gravel will be used as ballast, according to local conditions.

In addition to the improvements already referred to, the sum of about \$600,000 is being spent on the St. Louis-Kansas City line of the Rock Island, and is to be made one of the best pieces of road in the West.

Railway Matters in Washington.

Washington, April 13, 1910.

General discussion of the administration railway bill was begun in the Senate on Monday and several amendments were offered. The discussion had not much more value than those of former sessions, but the votes which were taken on three amendments are taken to indicate that the administration party has a safe majority by which to pass the bill. Senator Cummins, of Iowa, proposed to define and limit the jurisdiction of the commerce court and was voted down 36 to 28. Another amendment with a similar purpose was rejected 40 to 25. Three amendments proposed by Senator Elkins, who had the bill in charge, were adopted. It was predicted that the discussion would occupy at least two weeks, the number of

amendments to be offered being now given as 120. Senator Nelson, of Minnesota, joined the insurgents and denounced the bill as a sugar-coated and vicious piece of legislation designed for the benefit of the railways.

On Tuesday Senator La Follette, of Wisconsin, spoke three hours in criticism of the bill. Mr. La Follette gave most of his attention to Section 12, which authorizes one railway to acquire another, provided more than half of the stock of that other is already controlled. He took for his text the alleged evil of the acquisition of the Boston & Maine by the New York, New Haven & Hartford. He declared that President Taft and Attorney-General Wickersham had been guilty of gross neglect in not continuing the prosecution of the suit which was begun by President Roosevelt to annul the merger of the New Haven and the Boston & Maine, and declared that the governor and lawmakers of Massachusetts also were "enemies of the people." Senators Lodge, of Massachusetts, and Gallinger, of New Hampshire, made short but vigorous replies to the aspersions on their states, and pointed out glaring inaccuracies in Mr. La Follette's charges.

General debate on the bill was opened in the House on Tuesday by Representative Townsend, of Michigan, and by Chairman Mann, who explained the bill in detail. It is evident that there will be a long discussion in the House as well as in the Senate.

The Maryland Public Utilities Law.

The Public Utilities Commission which has been established by the Legislature of Maryland will have supervising power over all public service corporations in the State, including common carriers, steam railways, street railways, steamboats, canals and canal companies, ferryboats, gas and electric companies, telephone and telegraph companies, light, heat and refrigerating companies; water and water-power companies, and virtually every other species of public utilities corporation.

The commission has power to determine rates to be charged by each public corporation subject to the act. The rates are required by the act itself to be just and reasonable, and the commission is vested with power to conduct investigations. The commission is empowered to enforce its orders. Power is also given it, whenever it may deem it desirable to do so, to value the property of any public service corporation. The commission is to be appointed by the Governor and will be composed of three members, the chairman to receive \$6,000 a year and each of the other two \$5,000 a year. The terms of office will be six years. The Governor, on recommendation of the commissioners, will appoint a general counsel, salary \$4,800 a year, and the general will appoint an assistant counsel at a salary of \$3,000. The secretary of the commission is to get \$3,000 a year.

St. Louis Railway Club.

At the annual meeting of the St. Louis Railway Club on April 8 the following officers were elected: President, E. A. Chenery; first vice-president, H. G. Pfeifer; second vice-president, Charles Burlingame; third vice-president, J. B. Carothers; secretary, B. W. Frauenthal; treasurer, C. H. Scarritt; members of executive committee, W. H. Elliott and Tip-ton Stilwell.

Secretary Frauenthal's annual report showed that the present membership is 1,185, and that the club has a balance in its treasury of \$3,737.08. He stated that the present holder of the club's scholarship will graduate from the University of Missouri this year and that the executive committee desired to bring before the members the necessity of selecting another person for the scholarship and of designating the institution to which he shall be assigned, so that the members may aid the committee in taking proper action.

Railway Telegraph Superintendents.

The Association of Railway Telegraph Superintendents will hold its annual meeting at Los Angeles, Cal., on June 20 instead of May 20, as heretofore announced.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.

AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Fedna, Co., Toledo, Ohio.

AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A. T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 20, 1910; Los Angeles.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.

BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Second Monday in month; Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—Third Wednesday in month; Chicago.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Brynn, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Bldg.; 2d Wednesday in month.

RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.

RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—May 10-13; Los Angeles, Cal.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting 2d Tuesday in October.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.

RICHMOND RAILROAD CLUB.—Second Monday in month; Richmond, Va.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.

SHORT LINE R. R. ASSOCIATION.—First Monday in month; New York.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, 1134 La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.

SOUTHERN & SOUTHWESTERN R. R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The Attorney-General of Texas has ruled that officers and employees of the Texas State Railway cannot accept free transportation over other railways or give free transportation over the Texas State road.

It is reported in St. Paul that rates on live stock from St. Paul to Chicago will be increased about May 15; this to restore the equilibrium between live stock and dressed meat rates which was disturbed by the recent increase on packing house products.

In the last two days of March the movement of colonists westward and northward through St. Paul was heavier than ever before in a similar length of time, and the number of pieces of baggage passing through the station was 4,000. During the month of March 4,000 cars of immigrant movables passed through, of which one-fourth were destined to Canada.

The Hudson & Manhattan, operating the tunnels under the Hudson river at New York city, reports the number of passengers carried during the month of March as 4,398,017. The number of trains run during that month was 46,259, and 99.18 per cent. of these trains were run on time. During the rush hours trains regularly followed each other at intervals of 90 seconds, a record which, it is claimed, has never before been made by any railway operating under the absolute block system.

According to press despatches from Washington tariffs filed there indicate that the low rates on grain for export which have been announced by the New York Central to Boston will apply to New York City also, which means, no doubt, that the other roads leading from Buffalo will also make the reduction, and that it will apply to Philadelphia as well. The despatch indicates that this reduction is made only on grain coming from Canadian points. On wheat the rate from Buffalo is given as 4 cents a bushel, reduced from 5.5 cents.

The Lackawanna Steel Company and four other independent steel and iron concerns of Buffalo, N. Y., has petitioned the Interstate Commerce Commission to order reductions in the rates on coal and coke from the Connellsville section in Pennsylvania. The Pennsylvania and eight other roads are named as defendants. The complaint alleges that the present rates on coal and coke discriminate against Buffalo in favor of the United States Steel Corporation at Gary, Ind. The complainants have already secured an injunction from the Federal Court against a proposed advance of from \$1.65 to \$1.85 per ton. (March 18, p. 746.)

If any cotton raiser feels discouraged because of the spread of the cotton boll weevil, he should read the letter of President Finley, of the Southern Railway, which has just been published in the southern newspapers. Mr. Finley, in a lucid statement based on facts and conclusions presented by the Agricultural department, shows that although the pest has spread throughout the central and eastern part of Texas, and though it invades additional territory each year, those who conduct their farming operations intelligently are able to increase their crops in spite of the damage done by the insects. With proper selection of seed and preparation of the soil, the cotton farmer cannot only cope with the bugs, but at the same time can increase the amount of his crop. In other words, the same methods which tend to repress the weevil are highly profitable to the farmer without regard to whether this destroyer is or is not present in his fields.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 67-B, giving a summary of car shortages and surpluses by groups from November 25, 1908, to March 30, 1910, says: "There was an increase of 1,143 in the number of surplus cars, made up principally of miscellaneous equipment, box cars showing little change and coal cars a decrease of 1,030. The shortage was materially reduced, falling from 27,187 to 19,786. The box shortage decreased 2,700 and the coal 2,492 cars. The decrease in both

the surplus and shortage of coal cars was probably due to the anticipated suspension at the mines; the surplus being drawn on heavily for storage coal and the shortage being effected by the reduced demands for the following days' loading."

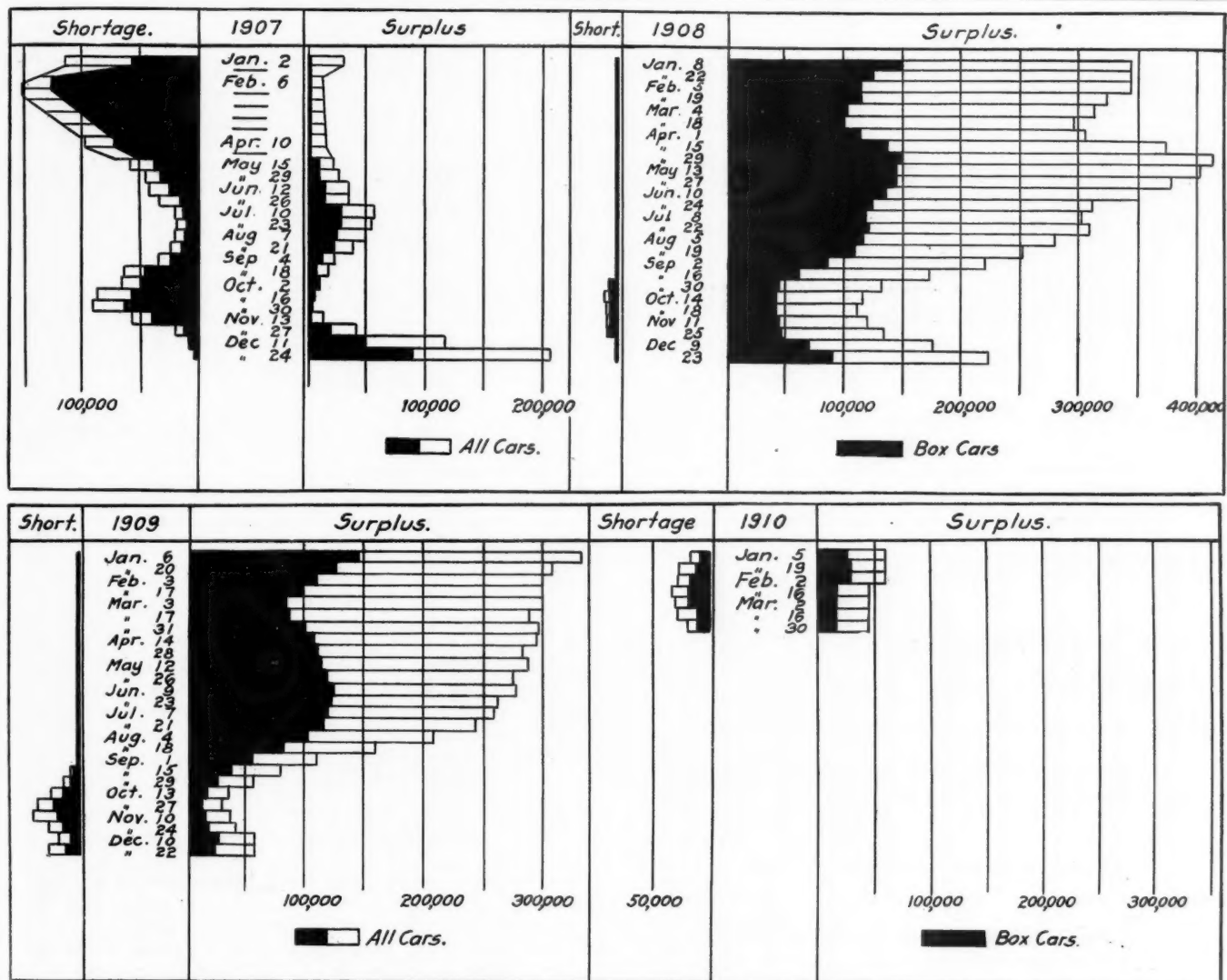
The accompanying table gives the car surpluses and short-

senting statistical bulletin No. 64, covering car balance and performance for September, 1909, says:

"The surplus equipment amounted during September to only 3.78 per cent. of the total, and the shop percentage was also slightly reduced. The total reduction on account of non-pro-

Group	Date.	Number of roads.	Surpluses.				Shortages			
			Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.
Group #1—March	30, 1910.....	8	227	516	219	105	30	31	...	21
" 2—"	30, 1910.....	22	317	154	1,480	566	555	7	1,812	34
" 3—"	30, 1910.....	20	1,401	257	220	2,036	978	237	1,985	555
" 4—"	30, 1910.....	10	966	0	319	528	2,936	355	2,143	540
" 5—"	30, 1910.....	20	674	264	298	614	1,041	734	577	26
" 6—"	30, 1910.....	18	4,171	192	2,386	4,241	2,035	151	...	311
" 7—"	30, 1910.....	4	448	213	333	571	...	...	...	...
" 8—"	30, 1910.....	14	731	22	59	1,037	58	12	129	105
" 9—"	30, 1910.....	9	998	253	280	536	...	...	...	859
" 10—"	30, 1910.....	18	3,822	1,072	1,658	4,731	265	77	3	119
" 11—"	30, 1910.....	7	2,079	3,173	148	1,357	912	...	...	153
Grand total		150	15,834	6,116	7,400	16,322	8,810	1,604	6,649	2,723
						45,672				19,786

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

ages for March 30, 1910, and the charts show surpluses and shortages in 1907, 1908, 1909 and 1910.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in pre-

ductive cars is therefore but 6.16 per cent., and as a consequence there is little difference between the averages, including surplus cars and those covering active cars only.

"There was a marked outward movement of cars during the month, bringing the total of cars on their home lines down to 67 per cent., the lowest figure since December, 1907. As usual in such a movement, there was a decided increase in the loaded car mileage, the percentage reaching 72.0, the highest

Freight Car Balance and Performance,
September, 1909.

	New York, New Jersey, Del., Md., Eastern Pa.	New England.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,620	50,620	215,788	167,687	169,648	374,174	16,612	131,894	25,738	115,665	85,883	2,042,973
Average number of system cars on line ..	427,917	50,620	147,263	107,646	109,642	284,162	6,649	85,687	13,522	65,141	67,201	1,395,450
Railroad-owned cars: Av. foreign on line ..	211,983	30,053	73,679	43,227	42,402	118,434	12,828	50,715	21,144	52,907	16,229	673,601
Total cars on line	639,900	80,673	220,942	150,873	152,044	402,596	19,447	136,402	34,666	118,048	83,430	2,039,051
Excess .....	.....	5,053	5,154	.....	.....	28,422	2,865	4,508	8,933	2,383	.....	.....
Per cent. cars on line to total owned ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Home	67	67	68	64	65	76	40	65	53	56	78	67
Foreign	32	32	34	26	25	32	77	38	82	46	19	33
All railroads	107	107	102	90	102	108	117	103	135	102	103	100
Private cars on line	3,378	41,464	10,110	2,163	6,140	14,517	1,729	8,124	2,031	8,520	3,163	101,339
Total, all cars on line	84,051	681,364	231,052	153,036	158,184	417,113	21,206	144,526	36,697	126,568	86,593	2,140,390
Per cent. of cars in shop	5.99	7.19	8.41	7.83	9.32	5.64	4.83	11.89	5.88	5.58	10.23	7.40
No. of freight engines owned	1,116	9,969	2,809	2,995	2,525	6,148	459	2,514	719	2,339	1,830	38,423
Av. cars on line per freight engine owned ..	75	68	82	51	63	68	46	58	51	54	47	64
Total freight-car mileage	42,883,263	487,223,629	145,644,671	109,242,687	109,404,543	322,878,002	28,676,586	89,986,654	28,610,633	110,122,868	76,800,614	1,551,474,150
Average miles per car per day	17.0	23.8	21.0	23.8	23.1	26.0	45.1	21.8	26.0	29.0	29.6	24.3
Per cent. loaded mileage	74.2	69.7	73.0	67.8	74.6	73.6	74.5	72.4	71.3	73.6	75.7	72.0
Ton-miles of freight, inc. Co. freight	446,552,690	7,914,584,747	2,273,056,258	1,796,570,025	1,588,873,949	3,324,247,314	405,264,033	1,315,340,855	355,257,787	1,656,505,608	1,054,236,173	22,130,489,439
Average ton-miles, including Co. freight:												
Per car-mile	10.4	16.2	17.2	16.4	14.6	13.8	14.7	14.6	12.4	15.3	13.7	15.2
Per loaded car-mile	14.0	23.3	23.5	24.3	19.6	19.0	19.6	20.5	17.4	20.8	18.1	21.2
Per car per day	177	387	160	391	337	339	689	318	323	442	406	367
Gross freight earnings	\$5,446,886	\$47,442,955	\$14,200,745	\$10,910,489	\$10,921,559	\$23,817,061	\$3,444,755	\$11,409,959	\$3,861,004	\$14,835,763	\$7,234,371	\$153,526,147
Average daily earnings: per car owner ..	\$2.40	\$2.38	\$2.19	\$2.17	\$2.12	\$2.74	\$6.91	\$2.88	\$5.00	\$4.49	\$2.81	\$2.61
Per railroad-owned car on line	2.25	2.48	2.14	2.41	2.32	2.54	5.90	2.79	3.51	4.23	2.89	2.63
All cars on line	2.16	2.33	1.09	2.38	2.32	2.43	5.41	2.63	2.63	3.95	2.79	2.50

October, 1909.

	New York, New Jersey, Del., Md., Eastern Pa.	New England.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,397	46,151	215,634	167,336	174,167	360,924	16,153	132,923	27,473	115,859	85,571	2,035,746
Average number of system cars on line ..	392,942	46,151	131,190	100,377	98,610	258,229	6,119	78,806	12,296	63,319	61,990	1,250,029
Railroad-owned cars: Av. foreign on line ..	39,334	246,448	80,734	52,431	55,229	139,435	13,387	58,695	26,175	58,247	22,198	792,313
Total cars on line	639,390	85,485	211,924	152,808	153,839	397,501	19,506	137,501	38,471	121,566	84,188	2,042,342
Excess .....	.....	10,088	.....	.....	.....	36,740	3,353	4,578	10,998	5,707	.....	6,596
Per cent. cars on line to total owned ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Home	61	59	61	60	56	71	38	59	45	55	72	61
Foreign	52	37	37	31	32	39	83	44	95	50	26	39
All railroads	113	96	98	91	88	110	121	103	140	105	98	100
Private cars on line	3,178	40,736	10,621	2,366	7,012	15,758	2,142	8,034	2,391	9,016	3,027	104,281
Total, all cars on line	88,663	680,126	222,545	155,174	160,851	413,422	21,648	145,535	40,862	130,582	87,215	2,146,623
Per cent. of cars in shop	4.91	6.25	7.13	7.32	8.87	5.16	4.07	11.05	5.44	5.15	8.47	6.59
No. of freight engines owned	1,126	9,968	2,805	3,005	2,584	5,944	446	2,555	759	2,341	1,825	33,358
Av. cars on line per freight engine owned ..	79	68	79	52	62	70	49	57	54	56	48	64
Total freight-car mileage	46,399,316	533,427,676	154,385,417	119,530,361	124,752,643	342,592,171	30,392,219	99,311,868	35,780,076	122,013,799	92,108,380	1,700,694,926
Average miles per car per day	16.9	25.3	22.4	24.8	25.0	26.9	45.3	22.0	28.2	30.1	34.1	25.6
Per cent. loaded mileage	75.4	70.5	74.8	69.7	75.9	74.5	79.8	82.0	71.7	74.8	76.1	73.4
Ton-miles, of freight, inc. Co. freight	511,808,447	8,719,694,979	2,438,119,222	1,884,600,210	1,751,797,986	2,834,669,758	477,969,689	1,387,592,110	400,101,523	1,858,378,279	1,432,009,735	23,796,741,938
Average ton-miles, including Co. freight:												
Per car-mile	11.0	16.3	17.3	15.8	14.1	14.4	16.2	14.0	11.2	15.5	15.5	15.4
Per loaded car-mile	14.6	23.2	23.1	22.7	18.2	19.4	20.3	19.2	15.6	20.7	20.4	21.2
Per car per day	186	414	396	392	354	291	757	323	316	465	530	379
Gross freight earnings	\$6,077,383	\$52,658,188	\$15,122,983	\$11,882,242	\$12,886,903	\$25,774,691	\$4,014,944	\$12,846,183	\$4,645,213	\$16,862,625	\$9,359,618	\$172,130,973
Average daily earnings: Per car owner ..	\$2.60	\$2.56	\$2.26	\$2.29	\$2.41	\$3.01	\$8.02	\$3.12	\$5.45	\$4.72	\$3.53	\$2.85
Per railroad-owned car on line	2.29	2.66	2.30	2.51	2.72	2.68	6.64	3.01	3.90	4.54	3.59	2.85
All cars on line	2.21	2.50	2.19	2.47	2.60	2.55	5.98	2.85	3.67	4.23	3.46	2.70

since October, 1907, and the second highest of which we have any record.

The tons per loaded car also show an increase, averaging 21.2 for the month. The effect of the increases in loaded mileage and tons per car is shown in the ton-miles per car per day, which for the active cars reached the record figure of 391, or nine ton-miles per car higher than the October, 1907, average.

The earnings per car on line for the active cars averaged \$2.67, the same as the October, 1907, average, the highest of which there is any record.

	Average miles per day.		Average ton-miles per car per day.		Average earnings per car per day.	
	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.
December, 1907.	21.9	23.9	289	316	\$1.98	\$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	25.8	271	328	1.82	2.20
March, 1908.	21.2	25.5	290	348	1.95	2.34
April, 1908.	19.6	24.5	258	324	1.83	2.29
May, 1908.	19.3	24.8	254	329	1.72	2.22
June, 1908.	19.6	24.7	276	347	1.88	2.37
July, 1908.	20.0	24.8	275	342	1.84	2.26
August, 1908.	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908.	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909.	21.7	25.9	306	365	2.04	2.43
March, 1909.	22.7	27.2	330	393	2.19	2.61
April, 1909.	22.4	26.8	310	371	2.13	2.54
May, 1909.	22.5	26.8	304	362	2.05	2.45
June, 1909.	22.4	26.5	314	371	2.13	2.52
July, 1909.	22.0	25.8	309	362	2.09	2.45
August, 1909.	23.2	26.3	340	384	2.29	2.59
September, 1909	24.3	25.9	367	391	2.50	2.67
October, 1909.	25.6	26.4	379	392	2.70	2.79

In presenting statistical bulletin No. 66, covering car balance and performance for October, 1909, Mr. Hale says:

"During October the surplus had practically disappeared, being but 1.57 per cent. of the total equipment. The shop percentage was reduced to 6.59 per cent., or 1.57 per cent. above the minimum figure. The difference in the averages for all cars and those for active cars is therefore very slight.

"The preponderance of interchange continued to be in an outward direction, and the cars on their home lines averaged only 61 per cent. of the total ownership, a reduction of six points under September. The result of this change is reflected in the loaded mileage, which increased to 73.4 per cent., the highest average of which we have any record.

"The tons per loaded car remain unchanged. The ton-miles per car per day for active cars show an increase of one ton over September, while the earnings per car increased to \$2.79, or .12 higher than in September, denoting the movement of a larger proportion of the higher class commodities than in the preceding month."

The accompanying tables show car balance and performance for the periods covered by the reports.

Growth of Canada.

It is estimated at Ottawa that the settlers coming into Canada from the western part of the United States this year will number 150,000, the number thus far being over 50 per cent. above the number that came in last year, when the total for the season was 90,000. The number expected from Great Britain this year is 100,000.

A Suggestion for Irish Railways.

"The Potato Institute" is the name of the farmers' instruction train which is to run over the Denver & Rio Grande. This train, which is managed by the traffic department of the road in connection with lecturers from the Colorado Agricultural College, has been run in Colorado for three years in succession. Since the train was started the farmers have produced more potatoes on the same ground and have secured better prices for them.

Crop Conditions.

The crop reporting board of the department of agriculture estimates that the average condition of winter wheat on April 1 was 80.8 per cent. of a normal, against 82.2 on April 1,

1909; 91.3 on April 1, 1908, and 87.0 the average condition for the past ten years on April 1. The decline in condition from December 1, 1909, to April 1, 1910, was 15.0 points as compared with an average decline in the past ten years of 4.5 points. The average condition of rye on April 1 was 92.3 per cent. of a normal, against 87.2 on April 1, 1909; 89.1 on April 1, 1908, and 89.5 the average condition for the past ten years on April 1.

Comparisons for winter wheat and rye states follow:

States.	Condition winter wheat—				Condition rye—			
	April 1		10-yr. av.		April 1		10-yr. av.	
Kansas	64	86	91	98	70	88	92	95
Nebraska	70	86	92	98	84	91	92	97
Indiana	84	68	81	98	90	75	88	98
Illinois	84	70	89	100	93	82	93	98
Missouri	69	79	90	98	80	85	92	98
Pennsylvania	89	87	86	86	91	90	89	87
Ohio	85	60	78	95	87	68	84	96
Washington	94	96	91	93	98	97	95	98
Oklahoma	87	83	86	98	87	89	88	96
Michigan	84	75	81	94	91	82	87	95
California	98	93	92	100	96	87	92	98
Oregon	93	97	93	94	97	98	98	100
Maryland	92	96	88	85	90	95	92	83
Idaho	97	97	97	100	99	99	97	99
Virginia	90	97	86	85	91	94	87	86
New York	94	88	88	96	96	88	90	96
Tennessee	84	92	87	95	86	93	87	95
Kentucky	84	81	85	97	88	80	86	96
Montana	97	..	..	99	97	97	96	98
North Carolina	90	93	89	89	90	94	88	90
Texas	89	66	79	95	82	50	78	93
West Virginia	88	88	83	91	90	94	86	91
South Carolina	88	92	88	92	89	91	88	94
Utah	94	97	..	97	99	97	100	95
Iowa	75	87	90	98	92	90	94	99
Colorado	96	..	..	93	93	96	88	95
Georgia	86	91	88	90	88	88	91	94
New Jersey	91	97	88	92	93	96	91	94
Arkansas	90	84	87	93	87	85	89	96
Delaware	96	98	88	88	94	95	90	87
Wisconsin	95	85	87	97	98	88	92	97
Alabama	85	90	89	95	90	88	89	92
Wyoming	97	99	..	95	97	90	96	99
Mississippi	90	90	88	94	..	..	..	..
Minnesota	..	..	..	..	96	90	87	93
United States	80.8	82.2	87.0	95.8	92.3	87.2	89.5	94.1

INTERSTATE COMMERCE COMMISSION.

Pullman Company Case.

For full report of this case see article in another column.

Rate on Iron Roofing Unreasonable.

Wheeling Corrugating Co. v. Baltimore & Ohio et al. Opinion by Commissioner Cockrell.

Commodity rate from Mississippi river to Nowata, Okla., reduced so as not to exceed class rate. (18 I. C. C., 125.)

Rule 27-D Western Classification Unreasonable.

Racine-Sattley Corps v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane.

The rule in western classification providing that shipments which are not marked in accordance with the requirements of the classification shall be subject to a rating one class higher than that otherwise applicable, was found to be unreasonable and reparation is awarded. (18 I. C. C., 142.)

Rate on Oak Ties Found Reasonable.

Continental Lumber & Tie Co. v. Texas & Pacific et al. Blocker-Miller v. same. Opinion by Commissioner Cockrell.

The rate on lumber and ties from certain points in Texas to El Paso, 825 miles, is 25 cents per 100 lbs. Between the same points a proportional rate of 18 cents on pine lumber and pine ties when destined to points in Arizona and New Mexico is charged. In the absence of a joint through rate the Texas & Pacific charged the lumber rate of 25 cents on oak ties for its portion of the through haul, and complaint asks a reduction of the rate on oak ties to the basis of rates on pine ties. The commission holds that a rate of a little over six mills per ton per mile on oak ties is not unreasonable and reparation is denied. (18 I. C. C., 129.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1910.
(See also issue of April 8.)

Mileage operated at end of period.	Name of road.	Operating revenues.			Total.	Way and Or Maintenance of structures, equipment.		Traffic.	Trans- portation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income comp. with last year. (or loss).	Increase (or dec.) last year.
		Freight.	Passenger.	Inc. misc.		Inc. misc.	Inc. misc.									
670	Atlanta, Birmingham & Atlantic	\$166,228	\$33,317	\$200,545	\$210,949	\$26,135	\$34,082	\$12,482	\$91,570	\$8,118	\$172,387	\$85,562	—	\$10,000	\$28,562	\$15,700
4,198*	Baltimore & Ohio	4,952,823	863,165	5,815,988	6,066,049	819,371	1,378,349	148,623	2,325,322	133,267	4,805,142	1,361,463	—	196,048	1,129,665	77,116
668	Central R.R. of New Jersey	1,423,246	293,750	1,716,996	1,828,708	116,630	300,242	26,132	518,778	37,069	990,691	820,017	1,847	95,918	734,946	263,107
616	Chicago, Indianapolis & Louisville	2,911,570	424,066	3,335,636	3,537,597	58,357	58,357	14,582	159,237	15,624	3,553,221	116,167	—	22,200	93,967	49,323
1,466†	Chicago, Milwaukee & Puget Sound	644,691	94,236	738,927	717,641	69,316	58,724	27,288	305,870	9,950	471,148	246,493	1,501	22,560	225,434	72,236
7,511	Chicago, Milwaukee & St. Paul	3,176,322	512,210	3,688,532	4,334,215	468,561	582,477	84,251	2,313,387	77,529	3,526,201	1,008,070	—	216,041	786,036	72,534
3,229	Chicago, Rock Island & Gulf	1,464,499	57,431	1,521,930	1,521,930	41,907	222,294	8,595	91,472	8,233	172,501	44,067	—	8,593	35,224	77,594
1,982	Cleveland, Cincinnati, Chic. & St. L.	1,511,904	47,273	1,559,177	1,559,177	180,482	386,244	84,767	956,146	48,653	1,656,253	515,273	—	74,000	433,469	110,143
843	Delaware & Hudson Co.	1,182,741	157,483	1,340,224	1,340,224	118,583	325,764	16,864	667,148	38,710	963,769	428,148	—	35,000	392,694	40,725
2,306	Denver & Rio Grande	1,330,537	282,145	1,612,682	1,612,682	142,706	327,365	36,492	685,106	44,343	1,236,012	445,869	—	69,000	372,684	183,674
780	Elgin, Joliet & Eastern	679,538	213,444	892,982	738,803	72,126	153,809	4,055	269,496	13,430	649,689	225,858	—	19,500	206,358	69,606
1,338	Galveston, Harrisburg & San Antonio	572,530	88,589	661,119	661,119	125,138	127,261	32,174	338,286	26,830	649,689	176,086	—	28,800	146,872	12,983
587	Grand Rapids & Indiana	254,802	88,589	343,391	343,391	48,992	40,576	9,582	168,492	13,078	310,734	55,761	—	23,674	32,087	2,067
789	Houston & Texas Central	2,937,428	88,344	3,025,772	3,132,130	64,630	995,754	113,204	1,690,406	92,419	3,296,597	1,193,533	—	16,485	991,909	5,381
1,159	Illinois Central	449,485	141,455	590,940	590,940	115,188	123,972	17,633	253,177	21,511	573,611	63,586	—	22,000	41,586	37,033
1,866	International & Great Northern	345,567	51,428	396,995	396,995	35,896	73,018	13,497	163,355	11,433	297,139	123,134	—	17,950	105,184	71,744
886	Lake Erie & Western	2,477,742	677,164	3,154,906	3,154,906	279,161	609,611	79,028	1,385,499	46,802	2,416,102	1,195,024	—	135,000	1,055,256	298,800
1,746	Lake Shore & Michigan Southern	1,507,249	419,018	1,926,267	1,926,267	185,483	233,773	70,023	960,445	46,931	1,356,635	573,210	—	110,000	455,730	183,674
3,588	New York Central & Hudson River	4,329,286	1,637,394	5,966,680	6,871,991	691,007	1,295,485	192,069	2,850,062	216,362	5,279,985	1,592,006	—	357,039	1,910,111	353,774
558	New York, Chicago & St. Louis	703,166	74,152	777,318	777,318	60,710	88,760	46,012	374,342	14,631	585,462	220,876	—	27,000	191,825	109,593
546	New York, Ontario & Western	460,026	65,595	525,621	525,621	54,669	70,120	96,887	109,719	14,856	448,471	96,198	—	16,666	73,067	36,311
602	Norfolk & Southern	148,589	40,232	188,821	188,821	71,420	96,887	25,329	65,936	13,701	122,505	76,901	—	6,200	70,556	1,432
467	Northern Pacific	750,713	141,477	892,190	892,190	139,888	211,356	34,229	418,987	13,701	838,481	106,775	—	24,708	70,556	493,697
5,849‡	Oregon Short Line	3,276,021	1,037,598	4,313,619	4,313,619	538,405	641,063	81,301	1,994,364	88,794	3,344,527	1,770,227	—	333,841	946,480	982,721
1,508	Oregon Short Line	1,132,321	293,670	1,425,991	1,425,991	131,691	180,062	32,989	412,635	46,931	788,984	729,512	—	55,416	668,072	61,658
1,024	Philadelphia & Reading	2,745,361	523,103	3,268,464	3,268,464	219,430	627,907	32,963	1,144,647	61,322	2,086,269	1,326,004	—	73,522	1,291,246	201,744
4,726	St. Louis & San Francisco	1,966,281	699,164	2,665,445	2,665,445	295,288	351,190	89,869	1,123,318	114,524	1,974,100	927,281	—	122,457	804,824	139,388
773	St. Louis Southwestern	454,468	89,937	544,405	544,405	80,118	85,206	27,031	139,346	23,528	364,229	206,442	—	18,490	187,107	3,789
703	St. Louis Southwestern of Texas	194,342	54,582	248,924	248,924	96,169	67,724	11,238	129,154	15,797	320,082	30,019	—	8,333	58,546	9,014
727	San Antonio & Aransas Pass	188,087	68,542	256,629	256,629	64,143	117,194	4,879	119,194	8,998	234,820	40,624	—	31,624	14,910	188,000
979‡	San Antonio & San Antonio	1,207,196	173,764	1,380,960	1,380,960	66,735	74,651	15,950	118,828	14,620	1,104,798	636,288	—	12,287	27,748	84,337
2,995	Seaboard Air Line	1,207,196	374,462	1,581,658	1,581,658	220,743	227,968	57,864	552,030	46,153	1,104,798	636,288	—	61,418	574,687	84,337
6,060†	Southern Pacific Co.—Pacific System	4,112,195	2,399,072	6,511,267	6,511,267	980,525	883,122	144,265	2,103,475	176,418	4,287,805	2,794,582	—	280,059	2,470,651	553,456
458	Texas & New Orleans	196,505	48,551	245,056	245,056	48,551	46,682	6,734	112,280	8,840	223,987	63,276	—	11,835	50,572	4,436
1,885	Texas & Pacific	838,655	286,923	1,125,578	1,125,578	182,779	217,914	18,708	505,353	34,100	958,854	226,679	—	38,394	195,576	32,325
EIGHT MONTHS OF FISCAL YEAR 1910.																
670	Atlanta, Birmingham & Atlantic	\$1,273,739	\$355,826	\$1,629,565	\$1,721,826	\$209,082	\$268,582	\$96,414	\$672,442	\$69,173	\$1,315,737	\$406,089	—	\$83,265	\$82,978	\$82,978
4,198*	Baltimore & Ohio	12,731,792	2,381,770	15,113,562	15,512,955	1,821,123	2,495,971	422,287	7,287,754	1,040,129	38,923,507	17,735,557	—	1,041,049	15,795,356	1,511,839
668	Central R.R. of New Jersey	3,603,564	663,165	4,266,729	4,519,894	316,927	819,371	135,428	1,857,487	322,205	8,589,151	6,962,804	—	782,438	6,372,041	985,201
616	Chicago, Indianapolis & Louisville	5,256,327	966,021	6,222,348	6,763,569	534,617	523,965	110,812	1,110,812	118,630	2,543,711	1,388,815	—	165,900	1,202,915	363,594
1,466†	Chicago, Milwaukee & Puget Sound	644,691	94,236	738,927	717,641	69,316	58,724	27,288	305,870	9,950	471,148	246,493	1,501	22,560	225,434	72,236
7,511	Chicago, Milwaukee & St. Paul	3,176,322	512,210	3,688,532	4,334,215	468,561	582,477	84,251	2,313,387	77,529	3,526,201	1,008,070	—	216,041	786,036	72,534
3,229	Chicago, Rock Island & Gulf	1,464,499	57,431	1,521,930	1,521,930	41,907	222,294	8,595	91,472	8,233	172,501	44,067	—	8,593	35,224	77,594
1,982	Cleveland, Cincinnati, Chic. & St. L.	1,511,904	47,273	1,559,177	1,559,177	180,482	386,244	84,767	956,146	48,653	1,656,253	515,273	—	74,000	433,469	110,143
843	Delaware & Hudson Co.	1,182,741	157,483	1,340,224	1,340,224	118,583	325,764	16,864	667,148	38,710	963,769	428,148	—	35,000	392,694	40,725
2,306	Denver & Rio Grande	1,330,537	282,145	1,612,682	1,612,682	142,706	327,365	36,492	685,106	44,343	1,236,012	445,869	—	69,000	372,684	183,674
780	Elgin, Joliet & Eastern	679,538	213,444	892,982	738,803	72,126	153,809	4,055	269,496	13,430	649,689	225,858	—	19,500	206,358	69,606
1,338	Galveston, Harrisburg & San Antonio	572,530	88,589	661,119	661,119	125,138	127,261	32,174	338,286	26,830	649,689	176,086	—	28,800	146,872	12,983
587	Grand Rapids & Indiana	254,802	88,589	343,391	343,391	48,992	40,576	9,582	168,492	13,078	310,734	55,761	—	23,674	32,087	2,067
789	Houston & Texas Central	2,937,428	88,344	3,025,772	3,132,130	64,630	995,754	113,204	1,690,406	92,419	3,296,397	1,193,533	—</			

Rate on Agricultural Lime Unreasonable.

John A. Okerson v. Pennsylvania Railroad et al. Opinion by Commissioner Cockrell.

Reparation awarded on basis of lower commodity rate established subsequent to shipment. (18 I. C. C., 127.)

Rate on Dry Beans Unreasonable.

Stevens Grocery Co. v. Grand Rapids & Indiana et al. Opinion by Commissioner Clark.

Reparation awarded on L.C.L. shipments from Grand Rapids, Mich., to Newport, Ark. (18 I. C. C., 147.)

Reparation for Carrier's Mistake.

F. L. Cressey for J. H. Cressey & Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Cockrell.

Complainant is awarded reparation on account of the failure of the initial carrier to route traffic as directed. (18 I. C. C., 132.)

Rules in Regard to Bulky Articles Unreasonable.

J. R. Jones v. Southern Railway. Opinion by Commissioner Clark.

The assessment of a charge on an L.C.L. shipment that is too long to be loaded through the side door of a 36-ft. box car on a minimum weight of 4,000 lbs. is found to be unreasonable. (18 I. C. C., 150.)

Informal Rulings Made in Conference.

Free transportation may not lawfully be given to the officers and employees of a bridge company which makes annual reports but files no tariffs because it is a non-operating company.

In the absence of specific tariff provision therefor demurrage does not accrue on derrick cars, pile driver cars and similar cars that are not and ordinarily cannot be unloaded, when owned or leased by a contractor doing work on the line or when standing on storage tracks.

Through inadvertence a carrier quoted a northbound rate of 26 cents instead of a southbound rate of 29.5 cents. A sale having been effected on the basis of the rate quoted application is made for authority to refund on that basis. Within a few months after the date of the movement the southbound rate was reduced to 17 cents. Held that reparation on the basis of the northbound rate must be denied, but that an application for authority to refund on the basis of the subsequently established southbound rate would be entertained.

The tariffs of certain carriers provide a 10-party fare from A to B but no such fare from B to C. On inquiry whether it would be legal to ticket a party of ten from A to C on the basis of the party fare from A to B and the individual fares from B to C when such combination makes less than the joint through individual fare from A to C, it is held that while a party of ten, acting on their own initiative would have the right to use the party fare from A to B and to purchase such transportation as is available from B to C, the carriers may not ticket them through from A to C on such a combination and thus defeat their own published through fare.

Although the tariffs of a carrier provided that it would not accept shipments consigned to "Shipper's Order, Notify," where the party to be notified is not located at destination, it nevertheless accepted such a shipment, and because of its failure on the transfer billing to note the shipper's instructions to notify the consignee at a distant point demurrage accrued at destination. Held, that the claim has no standing except on the carrier's admission that its tariff rule was unreasonable and a showing that it has been changed; and if presented under such conditions and acted upon favorably,

the order would require the maintenance of the newly established rule for a period of one year.

On inquiry as to the rates on a locomotive "on cars," from a point in New York to a point in the Province of Quebec, the carrier quoted a rate to Sherbrooke and a 7 cent local rate beyond, at 20 per cent. less than the actual weight. Charges were collected on that basis and the carrier now applies to the shipper for payment of an undercharge arising out of the fact that the tariff naming the rate beyond Sherbrooke contains no provision for a deduction from the actual weight of the shipment. The shipper makes the point that the rate beyond Sherbrooke is a Canadian rate and that the domestic carrier is therefore not prohibited by the act from adjusting the charges on the basis of the rate quoted by it. Held that it would be a violation of law to omit the collection of the undercharge.

In selling a round-trip ticket the carrier's agent neglected to punch the return limit in the margin. The ticket was used on the going journey in accordance with its conditions. The tariff permitted a stop-over at an intermediate point on the return journey. When the holder presented the ticket for validation that agent punched a return limit in the margin which rendered the ticket useless except for continuous passage back to the point of origin. Not observing this limitation the passenger stopped over, and on presenting the ticket at that point the agent marked it "Void," thus compelling the holder to purchase a ticket from that point to his home. He arrived there within the time limit under which the original ticket was sold, having traveled also over the route named in the tariff. Held that the holder was entitled to a refund of the excess fare paid on account of the carrier's error.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has adopted the uniform demurrage rules, as approved by the National Association of Railway Commissioners.

The Iowa Railroad Commission has ordered the uniform demurrage rules adopted by the American Railway Association to be put into effect on intrastate business. The uniform demurrage rules were already in effect on interstate business passing through Iowa.

The State Railroad Commission of Pennsylvania has issued an order requiring that street cars must always be stopped on approaching a grade crossing of a steam railway, and that the conductor must get off and go across the steam railway track ahead of his car, giving a signal, at the proper time, for the car to move forward.

The Oklahoma Corporation Commission has issued an order for a reduction of from 19 to 36 per cent. in present state class rates on all commodities except live stock. A hearing on the proposed new schedule has been set for April 25. Chairman Love announced that an order is being prepared canceling the commission's orders for rates on various commodities the enforcement of which was enjoined by Federal Judge Hook, and that a new scale of rates differing from the old enough to avoid conflicts with the court's order will be issued. The reduction ordered in class rates is regarded as in retaliation for the action of the railways in challenging in the courts previous orders of the commission requiring reductions in freight rates.

Texas Revaluation Refused.

Letter of Commissioner W. D. Williams to receiver of International & Great Northern.

We believe the law provides for only a single final valuation of any completed portion of a railway for stock and bond purposes. It makes due provision for the correction of errors, but none for revaluations. Even the purchasers of foreclosed lines must still remain subject to the original valuations.

If a policy of revaluation were to be inaugurated, then it would follow that a revaluation of its property could be required at the option of each railway company. Such an option would naturally be exercised only when it was confidently believed that changes had manifested themselves in the shape of increased values. And every time such a valua-

tion is increased more stocks and bonds will be issued, and once these have been issued they become fixed as burdens on the property.

Inasmuch as the commercial value of railways, just as of all other property, is constantly fluctuating, being up to-day and down to-morrow, or down to-day and up to-morrow, a policy of revaluation, if compelled by law, would, in the long run and inevitably, result in burdening the Texas railways with issues of stocks and bonds up to the highest of "boom" figures.

That a railway company has the absolute right to have its freight and passenger rates fixed with reference to its outstanding stocks and bonds was never attractive as a legal proposition, and it may be, as you say, that it has been definitely and for all time condemned by the supreme court of the United States. But it does not follow that the amount of stocks and bonds outstanding is no longer a factor in determining the reasonableness of rates.

And if this is done in ordinary cases where the state is not a party to the issuance of the stocks and bonds, much more weight may be given to the same facts, when, as here, in the case before us, the state controls not the freight and passenger rates alone, but the issuance of stocks and bonds as well, and this control is exercised in both cases through the same commission.

It is not unfair that each railway shall be valued at the time of its construction, or as soon afterward as is practicable, and that the amount of stocks and bonds to be issued against its property shall be fixed by its value as then found, and that this amount shall not be increased except as betterments and permanent improvements are afterward made. It is true that under this rule a railway constructed in 1898 might be valued at \$20,000 a mile, while another line, built in 1908, of substantially the same character and quality, might, because of increased cost of labor and material, be valued at as much as \$25,000 a mile. But this works no injustice as between the owners. Both the law and sound public policy require that the actual investment in railway properties shall be protected, but neither the law nor public policy demands more than this.

See an item in regard to the International & Great Northern in Financial News.

COURT NEWS.

The United States Circuit Court of Appeals, sitting at Louisville, Ky., April 11, refused the application of the Louisville & Nashville for an injunction against the order of the Interstate Commerce Commission reducing a certain rate from Montgomery to New Orleans and certain other cities. It appears that the rate in question, which had been voluntarily reduced to meet water competition, was restored when the water competition ceased, whereupon the commission ordered the lower rate continued.

In the supreme court of Mississippi April 11 the case of the State ex rel. R. V. Fletcher, Attorney-General, v. the Louisville & Nashville Railroad, was decided against the road. The court (Judge Alexander) holds that the company is liable to a fine of from \$200 to \$5,000 a day for violating the law which declares that foreign corporations domesticated in Mississippi shall not take their cases to the Federal court and annulling their right to do business in Mississippi if they do. The decision declares the state law constitutional. Chief Justice Whitfield dissented. He does not doubt that the United States supreme court will "knock the decision winding."

Suit has been filed at Columbus, Ohio, by Samuel Untemyer and others representing the minority stockholders' committee of the Kanawha & Michigan, of which John H. Stanton is chairman, seeking to prevent the confirmation of the sale of the Kanawha & Michigan majority stock to the Chesapeake & Ohio and the Lake Shore & Michigan Southern. The complainants in the suit say that the control of the Kanawha & Michigan by the Chesapeake & Ohio and the Lake Shore are competitors in Ohio, and that the objections which the lower courts found to the previous control of the Kanawha & Michigan by the Hocking Valley apply equally to the Lake Shore and the C. & O.

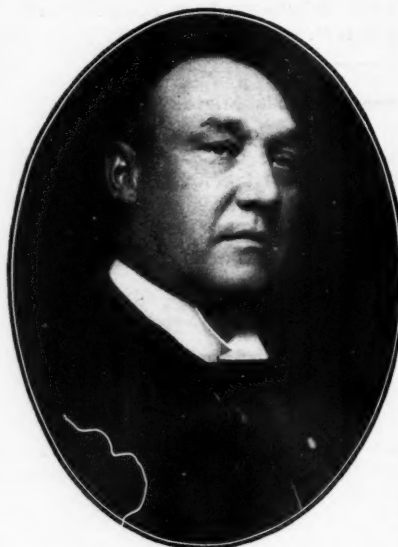
Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. H. Bower has been appointed auditor of the Wichita Valley, with office at Wichita Falls, Tex., succeeding W. Y. McCune, resigned.

William Lee Park, whose election as vice-president of the



William L. Park.

Illinois Central, with office at Chicago, has been announced in these columns, was born July 6, 1859, at Ovid, Mich. He attended the common schools and Baylie's College at Keokuk, Iowa, and began railway work in 1877 as a brakeman on the Union Pacific. He then served consecutively two years as brakeman, two years as freight conductor, two years as passenger conductor and eight years as assistant superintendent. In 1900 he was made superintendent and was appointed general superintendent, with office at Omaha, Neb., in

1904, which position he held until his recent appointment.

Operating Officers.

A. T. Hollenbeck has been appointed superintendent of telegraph of the Chicago Great Western, with office at Chicago.

J. J. Mahoney has been appointed transportation inspector of the Atchison, Topeka & Santa Fe, with office at Newton, Kan.

P. G. Flaherty has been appointed acting master of transportation on the Eastern division of the Grand Trunk, with office at Montreal, Que.

A. C. Ridgway, assistant to second vice-president of the Rock Island Lines, has been appointed assistant general manager, with office at Chicago.

P. G. Walton, superintendent of the Southern Railway at Greensboro, N. C., has been appointed superintendent of the Chicago & Alton, with office at Bloomington, Ill., succeeding J. W. Mulhern, resigned.

T. C. Collopy has resumed his duties as assistant superintendent of the Oregon Short Line at Pocatello, Idaho, succeeding Frank E. Eisenhard, recently appointed acting assistant superintendent, assigned to other duties.

W. S. Fender has been appointed an assistant superintendent of telegraph of the Southern Pacific, with office at San Francisco, Cal. He will have charge of the telephone service and such portions of the telegraph service as may be assigned to him from time to time.

W. Rudd, trainmaster on the South Texas division of the Missouri, Kansas & Texas at Smithville, Tex., has been appointed trainmaster on the Fort Worth division, with office at Denison, Tex., succeeding W. N. King, transferred to the traffic department. Charles Stanton succeeds Mr. Rudd.

The jurisdiction of J. F. Murphy, superintendent of the Arkansas division of the Missouri Pacific-Iron Mountain system, with office at Little Rock, Ark., has been extended to include the Little Rock, Hot Springs & Western between Benton, Ark., and Hot Springs, and over the Pine Bluff & Western.

C. L. French, whose appointment as superintendent of the Connellsville division of the Baltimore & Ohio, with office at Connellsville, Pa., has been announced in these columns, began railway work on October 1, 1883, as a messenger in the train despatcher's office on the Cumberland division of the Baltimore & Ohio. He was later appointed operator and then train despatcher. On June 1, 1899, he was made chief despatcher, which position he held until August 1, 1902, when he was appointed assistant trainmaster. The following February he was made trainmaster at Cumberland, Md., remaining in that position until his recent appointment as superintendent of the Connellsville division.



C. L. French.

Traffic Officers.

B. O. Edwards has been appointed a traveling freight agent of the Central of Georgia, with office at Macon, Ga.

A. E. Devine has been appointed a traveling freight agent of the Trinity & Brazos Valley, with office at Houston, Tex.

J. F. Van Rensselaer, general agent of the Southern Pacific, with office at Atlanta, Ga., has resigned to engage in other business.

W. N. King, trainmaster of the Missouri, Kansas & Texas at Denison, Tex., has been appointed general agent, with office at Denison, a new office.

F. M. Steele has been appointed a commercial agent of the Chicago Great Western, with offices at Des Moines, Iowa, succeeding B. J. De Groodt, transferred.

T. H. Gorman has been appointed general agent of the American Refrigerator Transit Company, with office at Tyler, Tex., succeeding E. W. Rice, promoted.

J. L. Fox has been appointed a traveling freight and passenger agent of the El Paso & Southwestern and the Morenci Southern, with office at Pittsburgh, Pa.

W. F. Benning has been appointed a traveling freight agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Toledo, Ohio, succeeding T. F. Hartnett, promoted.

Charles H. Gomm, soliciting freight agent of the Queen & Crescent Route at Chicago, has been appointed commercial agent, with office at Dallas, Tex. Henry Hoving succeeds Mr. Gomm.

Donald Allen, traveling freight agent of the Missouri, Kansas & Texas at Fort Worth, Tex., has been appointed a traveling freight agent of the Atlantic Steamship lines of the Southern Pacific Company, with office at Galveston, Tex.

R. S. Gordon, general baggage agent of the Gulf, Colorado & Santa Fe at Galveston, Tex., has been appointed assistant general baggage agent of the Atchison, Topeka & Santa Fe system, with office at Topeka, Kan. J. B. Moore succeeds Mr. Gordon.

L. H. McCormick, district passenger agent of the Rock Island Lines at Pittsburgh, Pa., has been appointed general agent in the passenger department, with office at Chicago, succeeding A. B. Schmidt, resigned, to go with the St. Louis & San Francisco.

H. N. Drummond, temporarily in charge of freight traffic on

the Minnesota & Iowa division of the Chicago, St. Paul, Minneapolis & Omaha north of Worthington, Minn., exclusive of the St. Paul, Minneapolis & Minnesota transfer, has been appointed a traveling freight agent in charge of that territory, with office at Mankato, Minn.

A. B. Schmidt, general agent in the passenger department of the Rock Island Lines in Chicago, has been appointed general agent in the passenger department of the St. Louis & San Francisco and the Chicago & Eastern Illinois, with office at Chicago.

M. F. Smith, commercial agent of the Chicago, Milwaukee & St. Paul at Dallas, Tex., has been appointed general agent of the Galveston, Harrisburg & San Antonio, with office at Houston, Tex., succeeding W. H. Taylor, resigned, to engage in other business.

James L. Harris, until a month ago general live stock agent of the Missouri Pacific-Iron Mountain system at Kansas City, Mo., has been appointed general live stock agent of the Chicago & Alton, the Toledo, St. Louis & Western, the Minneapolis & St. Louis and the Iowa Central, with office at Kansas City, Mo.

Engineering and Rolling Stock Officers.

E. H. Wade, master mechanic of the Chicago & North Western at Chicago, has been appointed supervisor of locomotives, with office at Green Bay, Wis.

D. Foley, supervisor of the Illinois Central at Carbondale, Ill., has been appointed an assistant roadmaster of the Chicago division, with office at Kankakee, Ill.

D. R. Day has been appointed supervisor of signals on the Northern Pacific, in charge of maintenance of signal apparatus on lines between Mandan, N. Dak., and Paradise, Mont., with office at Livingston.

H. L. Laughlin, formerly engineer maintenance-of-way of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed chief engineer of the Twin City & Lake Superior, with office at Minneapolis, Minn.

A. W. Thompson, chief engineer maintenance of way of the Baltimore & Ohio, has been promoted to chief engineer on the Baltimore & Ohio system, including the Baltimore & Ohio Southwestern, succeeding A. M. Kinsman, who was relieved at his own request and appointed consulting engineer. Mr. Thompson graduated from Allegheny college, Meadville, Pa., in 1897, and about two years later began railway work as assistant engineer of surveys on the Pittsburgh division of the Baltimore & Ohio. He was made assistant engineer of the Pittsburgh division in 1900 and the following year was appointed engineer of the Cumberland division. In 1902 he returned to Pittsburgh as division engineer, and the following year



A. W. Thompson.

went back to the Cumberland division as superintendent. He was transferred to Wheeling in 1904 as superintendent of the Wheeling division. In 1907 he was appointed chief engineer maintenance of way, which position he held at the time of his recent appointment. Mr. Thompson is a member of the American Society of Civil Engineers, and a member and director of the American Railway Engineering and Maintenance of Way Association.

Earl Stimson, chief engineer maintenance of way of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, has been appointed chief engineer maintenance of way of the Baltimore & Ohio, with office at Baltimore, Md. Mr. Stimson was born September 2, 1874, at Cincinnati, and was educated at Cornell university. He began railway work in June, 1895, as a rodman in the maintenance of way department of the Baltimore & Ohio Southwestern at Cincinnati. In 1898 he was made assistant division engineer at Chillicothe, Ohio, and in 1901 was appointed division engineer at Flora, Ill., and was subsequently transferred in the same capacity to Washington, Ind. In 1905 he was made engineer maintenance of way at Cincinnati, and in 1907 chief engineer maintenance of way of the Baltimore & Ohio Southwestern, which position he held at the time of his recent appointment.



E. Stimson.

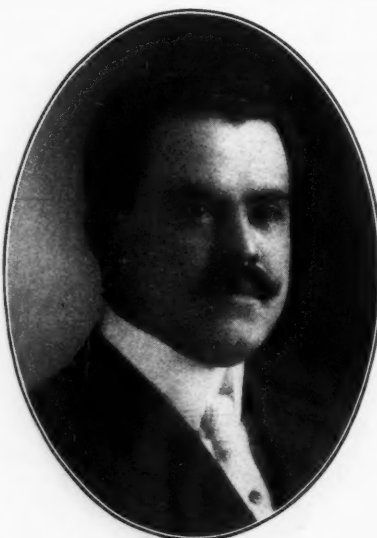
ton, Ind. In 1905 he was made engineer maintenance of way at Cincinnati, and in 1907 chief engineer maintenance of way of the Baltimore & Ohio Southwestern, which position he held at the time of his recent appointment.

Purchasing Officers.

A. E. Johnson, storekeeper of the Chicago & North Western at Kaukauna, Wis., has been appointed to the new position of traveling storekeeper for the entire system.

F. A. Bushnell has been appointed purchasing agent and general storekeeper of the Spokane, Portland & Seattle and the Astoria & Columbia River, with office at Portland, Ore., succeeding C. E. Thompson, resigned.

Augustin Herrera, whose appointment as purchasing agent of the National Railways of Mexico, with office at Mexico City, Mex., was announced in the *Railway Age Gazette*, Jan. 28, 1910, page 208, was born September 16, 1878, at Mexico City, Mex. He was educated in the Merchants' school, Mexico City, and began railway work March 1, 1895, with the Mexican Central. After serving in several minor positions in the material department he was made chief clerk of that department in 1901, and two years later was appointed material accountant with full charge of this branch until December 31, 1906. He was then appointed fuel agent, in charge of both oil and coal fuel supplies. Through a reorganization of the system, the title of fuel agent was abolished March 24, 1908, but Mr. Herrera's duties remained the same. In February, 1909, when the Mexican Central became part of the National Railways of Mexico, his duties were extended to cover the maintenance of the fuel service on the entire system. He was appointed purchasing agent of the National Railways of Mexico on January 1, 1910. The fuel department having been abolished and its operation transferred to the purchasing department, Mr. Herrera as purchasing agent also retains all his former duties as head of the fuel department.



A. Herrera.

Railway Construction.

New Incorporations, Surveys, Etc.

ALGOMA CENTRAL & HUDSON BAY.—An officer writes that an extension is to be built from Hawk Lake Junction, Ont., at mile 164, north to a connection with the Canadian Pacific at Hobon, 31 miles. The company already has track laid from Michipicoten northeast to Josephine mine, 20 miles, which is about six miles from Hawk Lake Junction, and is operating a line from Sault Ste. Marie, Ont., to mile 69, leaving about 101 miles yet to be built to connect with the line at Michipicoten. On this section grading has been finished but a number of steel bridges are yet to be put in before track can be laid. It is proposed to finish this work soon. The company will then have a through connection from the Minneapolis, St. Paul & Sault Ste. Marie north to Michipicoten and eventually over the new line north to the Canadian Pacific. On the Manitoulin & North Shore grading has been finished from mile 14 to mile 22 and track laying will be started soon, completing a connection with the Canadian Copper Company's mill at Crean Hill mine. (April 1, p. 917.)

ARANSAS TERMINAL.—An officer writes that grading work has been started by local contractors. The company is now in the market for a 40-ft. drawbridge, also rails and ties, to be used on a section of two miles. There are some additional contracts yet to be let, which will probably be given to local contractors. The line is being built from Aransas Pass, Tex., southeasterly along the channel of the Aransas Pass Channel & Dock Co. to deepwater on the east side of Harbor Island, where docks and warehouses are to be built. From the shore at Aransas Pass the line will pass over a solid fill, 9,000 ft. long, crossing Red Fish bay, thence across Steadman Island, about 700 ft., and will then cross the old Corpus Christi channel on a 500-ft. trestle, with a drawbridge, to have an opening of 40 ft. at the center of the channel, thence crossing an arm of Corpus Christi bay over a fill to be about 1.5 miles long, continuing on Harbor Island to the east side of the island. The Aransas Pass Channel & Dock Co. will put up wharves and warehouses, also a grain elevator, a cotton compress and coal docks. E. O. Burton, president, Gibbs building, San Antonio; C. S. Corrigan, chief engineer, box 183, Aransas Pass. (March 11, p. 546.)

BINGHAM & GARFIELD.—According to press reports construction work will probably be started soon on a new line from Bingham Canyon, Utah, north to Garfield, on the San Pedro, Los Angeles & Salt Lake, about 20 miles. D. C. Jackling, general manager, Utah Copper Co., which has two smelters at Garfield, is quoted as saying that surveys have been made. Contracts for the construction work valued at \$500,000 are said to be let. The company is not prepared at the present time to give any detailed information regarding this work. The general offices of the company are in the McCornick building, Salt Lake City, Utah.

BOSTON & EASTERN (ELECTRIC).—An officer writes that the Massachusetts Railroad Commissioners have decided that this road should be built for public convenience and necessity. The company is now seeking an act which will allow it to build a tunnel under Boston harbor. The plans call for a line from Beverly to Boston, 41 miles, and the company is prepared to spend about \$11,000,000. Arthur Sturges may be addressed, 110 State street, Boston.

BOSTON & MAINE.—See New York, New Haven & Hartford.

CANADIAN NORTHERN.—A contract has been given to the Gowan Construction Co. for building an extension from near Moose Jaw, Sask., southeast, and to the Northern Construction Co. for work from Vegreville, Alb., southwest towards Calgary, also on the Goose lake branch, building from Saskatoon, Sask., southwest.

CANADIAN PACIFIC.—An officer writes that the program for construction work to be carried out this year is as follows:

From Outlook, Sask., northwest to Macklin, on the Pleasant Hills branch, 147.7 miles. Contract for grading let to McArthur & Dutton, Winnipeg, Man.

Regina, Sask., south to Griffin, 79 miles. Contract not let.

Craven, Sask., north to Colonsay, on the Lanigan section, 110.3 miles. Contract for grading let to John Bradley, Brandon, Man.

Extension of the Weyburn line westerly from Forward, Sask., 25 miles. Contract for grading let to McArthur & Dutton, Winnipeg.

Extension of Kipp line northwest from Carmangay, Alb., for 30 miles. Contract for grading let to Foley, Welch & Stewart, St. Paul, Minn.

Extension of the Lauder line from Tilston, Man., west for 24 miles. Contract for grading let to P. Lamb, Winnipeg.

A high level bridge is to be built over the Saskatchewan river between Strathcona, Alb., and Edmonton. Contract not yet let.

A steel viaduct is to be built over the Saskatchewan river at Outlook, Sask. Contract not yet let.

Second-track to be laid from Winnipeg west to Portage la Prairie, 50 miles. Contract let to J. Hargrave & Co., Winnipeg. (April 8, p. 969.)

Improvements will be made by the Canadian Pacific, it is said, to its yards at Kamloops, B. C., at a cost of \$175,000. The work is to be started soon.

CENTRAL PACIFIC.—See Southern Pacific.

CHARLES CITY WESTERN.—Surveys are being made, it is said, for a line from Charles City, Iowa, southwest for about 20 miles. The company has a capital of \$300,000. H. E. Bennett, assistant general manager, Charles City.

CHARLES, CROSBYTON & SOUTH PLAINS.—Incorporated in Texas to build from Spur, Tex., to Lubbock, 68 miles, also from Crosbyton, northwest to Plainview, 52 miles. O. L. Spencer, H. W. Coonley, J. S. Coonley and E. H. Bailey, Chicago; A. Coonley and H. Coonley, Riverside, Ill., are interested.

CHEROKEE BELT & INTERURBAN.—Preliminary surveys were made about two years ago and right-of-way, it is said, has been secured and finances provided to build the line. The company has a capital of \$500,000 and plans to build a line from Skiatook, Okla., east via Collinsville and Claremore to Pryor creek, 45 miles. Work is now under way. The interurban service and freight office is to be handled by steam motive power, while for passenger traffic gasoline motor cars will be used. E. Batchman, president, St. Louis, Mo.; P. E. Montel, vice-president and general manager, Kansas City.

CHERRYVALE, OKLAHOMA & TEXAS.—A contract is said to have been given to the Continental Construction Co., Caney, Kans., to build the first section of five miles from Caney. The projected route is from Cherryvale, Kans., southwest toward El Paso, Tex., with a number of branches. B. J. Dalton, chief engineer, Lawrence. (Apr. 8, p. 969.)

CHICAGO, MILWAUKEE & ST. PAUL.—An officer writes that work is now under way putting in second-track between Camp Douglas, Wis., and West Salem, also on the section between Richmond, Minn., and Wabasha, a total of 90 miles, which it is expected will be finished this spring. This work includes rebuilding the original tunnel at Tunnel City, Wis., which was abandoned in 1876; with the completion of this work the company will have a continuous double track between Chicago and Minneapolis, with the exception of a short section over the Mississippi river at La Crosse, Wis.

CHICAGO, MILWAUKEE & PUGET SOUND.—Grading work is expected to be finished in about 60 days on the branch from the main line at McLoughlin, S. Dak., about 25 miles west of the Missouri river, north to a crossing of the Cannon Ball river in North Dakota, thence westerly and northwesterly along the north fork of the Cannon Ball river to the western boundary of Hettinger county, at New England, 135 miles. Contract was let last year to McIntosh Brothers, Milwaukee, Wis.

CHICAGO, ROCK ISLAND & PACIFIC.—See "Improvement Work on Rock Island Lines," under General News.

CUMBERLAND VALLEY.—According to press reports improvements are being made to complete the double-track between New Kingston, Pa., and Mechanicsburg, and between Greason and Newville. This will give a continuous double-track line

between Harrisburg and Shippensburg, 40 miles. It is expected that the work will be finished in about three months. The improvements, besides shortening the distance between Greason and Carlisle, will eliminate several bad curves.

EASTERN MONTANA ELECTRIC.—An officer writes that this company proposes to build through Yellowstone valley, Mont., via Billings and Laurel, through the Clark Fork district to Bear Creek. Work will probably be started this fall. A. C. Logan, president, and F. A. Kesselkuth, chief engineer, Billings.

EAST TEXAS TRACTION.—An officer writes that this company is only a preliminary association and that organization has not yet been completed. Definite action will not be taken until a report is filed by the Fred A. Jones Co., engineers, Houston, Tex. The proposed route is from Dallas, Tex., east to Terrell, 33 miles. S. B. Marshall, president; E. W. Morten, Jr., vice-president; C. L. Wakefield, secretary and manager, Dallas. (Feb. 4, p. 280.)

EL PASO & SOUTHWESTERN.—An officer writes that surveys are being made between a point on the main line and Tucson, Ariz. No plans have as yet been made for construction and the survey is simply being made to ascertain the cost of a line to that place. (April 8, p. 970.)

FORT WORTH, MINERAL WELLS & WESTERN (ELECTRIC).—An officer writes that contracts are to be let about May 15 for a line on which both steam and electricity will be used as the motive power. The projected route is from Fort Worth, Tex., northwest via North Fort Worth, Azle, Springtown, and Agnes to Poolville, thence southwest via Adell, Authon and Blue Springs, to Mineral Wells, about 60 miles. Paul Hurley, secretary and treasurer, Fort Worth, Tex. (Sept. 24, p. 563.)

FRASER RIVER LUMBER COMPANY'S ROAD.—A contract has been given to S. H. Abbot, Seattle, Wash., it is said, for building a nine-mile extension of this logging line in the Cox district, British Columbia. It is said that it will cost about \$10,000 a mile to build the extension.

GALLATIN VALLEY (ELECTRIC).—An officer writes that a contract was given to Callahan Brothers, Logan, Mont., March 31, for grading and bridge work on an extension from Bozeman, northwest to Three Forks, 27.50 miles. Work was started April 6 and it is expected to have the line finished by September 1. (March 18, p. 750.)

GALVESTON-HOUSTON (ELECTRIC).—A contract for grading is said to have been given to J. C. Kelso, Galveston, Tex., for the section from a point two miles beyond Texas City junction to Clear creek, 16 miles, and an additional contract for work on 19 miles has been let to Hartley & Ford, Bay City. The company was organized to build an electric line from Houston southeast to Galveston, 50 miles. (March 18, p. 750.)

GRAND TRUNK.—The governor has signed the bill passed by both houses of the state legislature of Rhode Island incorporating the Southern New England, under which name the Grand Trunk proposes to build an extension to Providence, R. I. The projected route is from Palmer, Mass., to which point the Grand Trunk now has a connection, through Rhode Island, connecting Woonsocket, Valley Falls and Pawtucket with Providence, reaching tidewater at the Providence river. (Feb. 18, p. 329.)

HANNIBAL & NORTHERN MISSOURI (ELECTRIC).—Surveys are said to be made for this line from Hannibal, Mo., on the Mississippi river, northwest via Palmyra, Philadelphia, Bethel and La Plata to Kirksville, about 100 miles and contracts are to be let about May 1. F. W. Latimer, president, Galesburg, Ill., and the Roberts & Abbott Co., are the engineers, Cleveland, Ohio. (July 30, p. 215.)

INTERNATIONAL ELEVATED RAILROAD.—Incorporated in Delaware, with \$50,000,000 capital and office at Washington, D. C. The plans call for building monorail lines in various places. An incorporator writes that officers will be named about April 20. G. S. Schroeder, 1114 H street, Northwest, Washington, may be addressed.

IOWA & DAKOTA INTERURBAN.—Incorporated in South Dakota,

with \$500,000 capital and office at Yankton, S. Dak. The company plans to build from Sioux City, Iowa, northwest to Mitchell, S. Dak., about 135 miles. It is estimated that it will cost \$25,000 a mile to build the line. The line will traverse Woodbury and Plymouth counties, Iowa, and Union, Clay, Turner, Yankton, Hutchinson, Hanson and Davison counties, S. Dak. The directors include: C. P. Wells, E. E. Bamford, H. E. Valentine, Centerville, S. Dak.; L. F. Phillips and W. G. Kirkpatrick, Wagner, and A. Mungson, Lake Andes.

JOHNSTOWN & ALTOONA (ELECTRIC).—An officer writes that it is expected to begin grading work in June from South Fork, Pa., northeast via Portage, Cresson and Gallitzin to Altoona. The work will be fairly heavy; about 34 per cent. will be rock work. The company will build 12 bridges along the line and put up a power house. G. U. G. Holman, general manager, Johnstown. (March 25, p. 850.)

KETTLE VALLEY LINES.—See Spokane & British Columbia.

KINDER & NORTHWESTERN.—An officer writes that a contract has been given to Hugh Walker, to build from Kinder, La., to timberlands. Track has been laid on three miles. A. J. Peavy, president; Frank Shutts, chief engineer, Shreveport. (Apr. 8, p. 970.)

LACLEDE, DALLAS & WESTERN.—Maps and profiles of the projected line from Phillipsburg, Laclede county, Mo., to Buffalo, Dallas county, are ready and the company will receive contractors' bids. H. W. Smith, American Bank building, Kansas City, Mo., is the chief engineer. (Feb. 18, 1910.)

LONG ISLAND.—This company will build during 1910 an additional track from Springfield junction, L. I., to Valley Stream, and two additional tracks from Valley Stream to Lynbrook. This will give a double-track line from Jamaica to Lynbrook and points beyond on the Montauk division. The double-track electrified line from Jamaica to Long Beach is expected to be put in operation some time this summer. The Jamaica improvement begins at Van Wyck avenue, where the main line improvement ends. The crossing at that point will be eliminated as well as those at Rockaway road, Beaver street, Catherine street, South street and at Division street. Arrangements will also be made for a new street under the railway at Guilford street. The improvements include the large new station and office building in Jamaica, extensive changes in the roundhouse, a new boiler plant, heating plant, ash pit, new water supply, gas plant and buildings for the men; there will be 1,810,000 cu. yds. of embankment, 213,120 lin. ft. of new track, 48,700 cu. yds. of concrete, and 3,850 tons of steel will be required for bridges. (March 4, p. 461.)

MARION RAILWAY.—Incorporated in Illinois, with \$10,000 capital, and office at Marion, Ill. The plans call for a line from a point on the Herrin Southern, about three miles southwest of Marion, to Marion, thence northerly to Johnson City, in Williamson county. The directors include: A. E. Harper, E. J. Hughes, L. D. Dody and C. A. Bickett, Chicago.

MEXICAN PACIFIC.—According to press reports from El Paso, Tex., this company has secured the concession held by the Mexican-American Holding Co. to build from Manzanillo, Mex., southeast down the west coast of Mexico to Salina Cruz, 930 miles. Joseph Castellot, vice-president, Mexico City. (April 1, p. 918.)

MIDLAND CONTINENTAL.—Organized to build from Pembina, N. D., southwest to Edgeley, about 212 miles. J. T. Adams, Columbus Savings & Trust Co. building, Columbus, Ohio, has the general contract, and will sublet 20 miles, it is said, between Edgeley and Jamestown. F. K. Bull, president, Racine, Wis.; G. P. Beach, engineer in charge of construction, Jamestown, N. D. (June 18, p. 1329.)

MISSOURI, KANSAS & TEXAS.—An officer is quoted as saying that plans have been adopted for double-tracking the main line between Dallas, Tex., and Parsons, Kan., 380 miles. Extensions will also be built in Texas from time to time, but plans for this work have not yet been definitely decided upon. According to a report, an extension is to be built from San Antonio southeast to Kingsville, about 160 miles. (March 18, p. 750.)

MONTANA ROADS (ELECTRIC).—The Chamber of Commerce of

Missoula, Mont., is said to be negotiating with W. H. Smead, for the construction of an electric line from Missoula, Mont., north to Polson, about 75 miles.

NEW YORK & NORTH SHORE TRACTION.—This company expects to put in operation an extension from Flushing, L. I., to Whitestone about June 1.

NEW YORK, NEW HAVEN & HARTFORD.—In addition to double-tracking work on the Air Line division, plans are said to be made to put up a new bridge at Middletown, Conn., at a cost of \$1,000,000, to replace the present single-track structure. Plans also said to have been approved to build connecting links on the Boston & Maine, to complete a through line for that company over its own tracks north to Sherbrooke, Que. Two short sections of the Central Vermont are now used in southeastern Vermont. It is said a connecting link is to be built from Brattleboro, Vt., to Hinsdale, N. H., to connect the Connecticut & Passumpsic division with the Ashuelot branch, and as soon as this work is finished a link is to be built from the east end of the Windsor, Vt., bridge, north to West Lebanon, N. H. From White River junction, just northwest of West Lebanon, south to South Vernon junction, is 74 miles. This section is used by both roads for through trains. Of this the 14-mile section from White River junction, south to Windsor, is a Central Vermont line; the next 50 miles south to Brattleboro is a Boston & Maine line, and from Brattleboro to South Vernon junction, 10 miles, the route is over a Central Vermont line.

NORTH CAROLINA ROADS.—Merchants and other residents of Wilmington, N. C., propose to build a line to connect the port of Wilmington with Knoxville, Tenn. Such a line would reach the coal fields in Tennessee. The Chamber of Commerce at Wilmington is said to be interested.

OMAHA, COUNCIL BLUFFS & SIOUX CITY (ELECTRIC).—An officer writes that the projected route is from Omaha, Neb., east to Council Bluffs, Iowa, thence north via Beebeetown, Logan, Magnolia, Little Sioux and Onawa to Sioux City, about 100 miles, and that the prospects of building the line are good. About the middle of April the company will be in a position to give definite information. M. H. Miller, president, P. O. Box 974, suite 200, Youngerman block, Des Moines, Iowa.

OREGON TRUNK LINE.—According to press reports bids are to be opened April 18 for the construction of 111 miles of line between Madras, Ore., and the north line of the Klamath Indian reservation. Work is to be started May 1 and finished by January, 1911. J. F. Stevens, president, Portland, Ore. (April 8, p. 972.)

According to press reports work is to be started about June 1 on a branch line from Ashton, Idaho, southeast to Driggs, 40 miles. The line is to be built to open up new coal and oil fields in the Teuton valley. A branch is also to be built to coal properties in the Driggs district.

OTTAWA, RIDEAU VALLEY & BROCKVILLE.—This company is being incorporated by the Canadian government to build a 60-mile line from near Ironside, in the township of Hull, about five miles from Ottawa, Ont., south through Ottawa and the counties of Carleton, Grenville and Leeds to Brockville, on the St. Lawrence river, opposite Morristown, New York, where connection will be made by ferry with the New York Central Lines. The line is to be built to develop the ore mines. It is expected that contracts will be let soon. There will be one bridge about 400 ft. long over the Rideau river and some other short bridges, not exceeding 100 ft. each. The line will be about 20 miles shorter than the existing line. Extensive water power will be developed on the Gatineau river about 2.5 miles from the mines. G. E. Kidd, 25 Sparks street, Ottawa, is solicitor. (Jan. 7, p. 69.)

RUTLAND RAILWAY LIGHT & POWER Co.—Work is said to be under way on an extension of seven miles from Fair Haven, Vt., to Poultney.

SACRAMENTO & SIERRA (ELECTRIC).—Surveys have been made, it is said, for a line from Sacramento, Cal., northeast to Lake Tahoe, about 126.5 miles, but contracts have not yet been let. J. M. Graham, chief engineer, 37 Stoll building, Sacramento.

ST. LOUIS-KANSAS CITY (ELECTRIC).—An officer writes that

the company is not ready to announce the intermediate points along the proposed route from St. Louis, Mo., to Kansas City, 250 miles. The line is to be double-tracked and will be equipped with the latest electrical appliances. The right-of-way will be 100 ft. wide. The company owns 10,000 acres of coal lands and will put up a power plant. Satisfactory grades have been secured and work will probably be started by June. D. C. Nevin, president, Commerce building, Kansas City, and W. B. Cauthorn, chief engineer, Columbia.

SANFORD & TROY.—See Seaboard Air Line.

SEABOARD AIR LINE.—The Dunnellon branch was opened for freight traffic from Early Bird, Fla., southward to Anderson Mine, 17.4 miles, on March 28.

The Sanford & Troy, from Colon, N. C., to Cumnock, eight miles, was opened for freight traffic April 1.

The Agricola extension, from Edison junction, a point on the line between Plant City, Fla., and Nichols, was opened for freight traffic to Agricola, 12.5 miles, on April 11.

SOUTH CAROLINA & WESTERN.—An officer writes that this company has been chartered to build from McBee, S. C., south-east via Hartsville and Darlington, to Florence, 40 miles. W. R. Bonsal, president and treasurer of the North & South Carolina, Hamlet, N. C., is interested. (Feb. 18, p. 380.)

SOUTHERN NEW ENGLAND.—See Grand Trunk.

SOUTHERN PACIFIC.—According to press reports, the roadbed of the old line of the Central Pacific around the head of Great Salt Lake in Utah, is to be improved, to carry heavy trains. The present roadbed is equipped with light rails and the improvements are to be made to provide a route when traffic is blocked on the Ogden-Lucin cut-off across the Great Salt Lake.

An officer writes that owing to the steady rise in the Great Salt Lake, Utah, during the past few years, the company has found it necessary to do considerable work on the line across the lake in the way of raising embankments, riprapping, etc. Work is now about to be started to raise the west end of the long trestle 5 ft. higher than the present level on about 4,200 ft., that section being at this time about 5 ft. lower than the main trestle. This is to be accomplished by building a second-track trestle alongside the present trestle for the 4,200 ft., and when this is finished traffic will be turned over the new structure, and the work of raising the level on the existing structure will be started. This improvement will provide a double-track on the west end of the trestle only. There is at the present time a double-track from the west end of the trestle to Lakeside on fills. The company does not intend to double-track the entire line across the lake at present, although traffic conditions may warrant this being done later on. The work to be carried out at the present time will cost about \$500,000, and it is expected will be finished this coming fall or early in the winter. In addition to raising the west end of the trestle, the company is also going to raise the fills both east and west of it about 3 ft. (April 1, p. 919.)

SPOKANE & BRITISH COLUMBIA.—A contract is said to have been given to W. P. Tierney & Co. for a 10-mile extension of the Kettle Valley Lines up the north fork of the Kettle river in British Columbia. It is said that construction work on the Midway-Penticon section will be started in June.

SPOKANE INTERNATIONAL.—According to press reports a branch is to be built from a point between Ross station, Idaho, and Rathdrum, southeasterly to La Crosse.

TOMBIGBEE VALLEY.—See an item in regard to this company in Railway Financial News.

TUCUMCARI, PORTALES & GULF.—Organized to build from Tucumcari, N. M., southeast via Pyote, Tex., to Del Rio, about 465 miles. Surveys are said to be made for the first 50 miles, and bids are wanted for this section. M. J. Healy, president and general manager, Pyote. (Mar. 11, p. 548.)

WESTERN MARYLAND.—A contract for the construction of the branch line from Cumberland, Md., northwest to a connection with the Pittsburgh & Lake Erie at Connellsville, Pa., about 83 miles, has been let to the Carter Construction Co., Pittsburgh. (March 25, p. 850.)

Railway Financial News.

BEAUMONT, SOUR LAKE & WESTERN.—Stockholders are to vote May 27 on the question of authorizing an issue of first mortgage 6 per cent. bonds of 1910-1940, secured by a mortgage on the property at the rate of \$30,000 per mile of line. The bonds are presumably to be deposited when issued under the new St. Louis & San Francisco (New Orleans, Texico & Mexico division) bonds.

CENTRAL OF NEW JERSEY.—Stockholders are to vote May 2 on the question of guaranteeing principal and interest on the \$20,000,000 consolidated 4 per cent. mortgage bonds to be issued June 1, 1910, by the Lehigh & Wilkesbarre Coal Co.

CHICAGO, ROCK ISLAND & PACIFIC.—E. D. Kenna has been elected a director, succeeding H. S. Cable, resigned.

DELAWARE & HUDSON.—Stockholders are to vote May 1 on the question of modifying the sinking fund ordinances of the company so as to permit the application of the sinking fund to defray the cost of increased reserves for coal or to the acquisition of property.

DETROIT, MACKINAC & MARQUETTE (LAND GRANT).—No interest was paid on the income bonds of April 1. In 1908 1 per cent. was paid in April and nothing in October; in 1909 nothing was paid in April and 1 per cent. in October.

HOCKING VALLEY.—Stockholders are to vote May 11 on the question of increasing the \$11,000,000 outstanding common stock to \$26,000,000. The plans of the management in regard to the new common stock have not been made public. See an item in regard to this company in Court News.

INTERNATIONAL & GREAT NORTHERN.—The Texas Railroad Commission has refused to make a revaluation of the property, on which revaluation a reorganization plan was to have been based. An abstract of the opinion of the commission is published in State Commission news. If the commission does not modify its present order the valuation fixed by the commission in 1895 will stand with the cost of subsequent betterments added. This will allow for a total valuation of \$30,726,000, or \$13,917,000 less than the amount required to provide for the debts and capital stock which Receiver T. J. Freeman estimates at \$45,000,000.

The funded debt of the company consists of \$11,291,000 first mortgage bonds, \$10,391,000 second mortgage and \$2,996,052 third mortgage bonds. There is \$9,755,000 stock outstanding, making a total capitalization of \$34,453,000. The company also has a floating debt of about \$6,000,000 which with the unpaid interest on its second and third mortgage bonds amounting to \$2,000,000 in addition to car trusts of \$481,000 makes a total of \$43,000,000. Allowing the floating debt and unpaid coupons or a total of \$8,000,000 to be provided for out of the \$31,000,000, a balance of only \$23,000,000 would remain. This would provide for the first and second mortgage bonds and about \$1,300,000 thirds, of which only \$1,100,000 are outstanding in the hands of the public, the remainder being held by the Gould estate, which also owns all of the \$9,755,000 capital stock.

To provide the necessary cash for the reorganization with the limited valuation allowed on the property some heavy assessments will have to be levied on either the bonds or stock or both. The price at which the third mortgage bonds are selling, in the neighborhood of 20, would indicate that these will be called on to furnish some of the cash. The firsts and seconds will probably remain undisturbed and their market price of 109 and 112, respectively, would seem to bear this out.

The Texas law provides that "in case of emergency involving the public interest or the existence of the property, the commission may permit the issuance of additional bonds, but in no case shall the aggregate amount of both stocks and bonds exceed the valuation of the property by more than 50 per cent." If this clause is invoked, the commission may permit the issuance of securities up to \$45,000,000, or the full amount of the indebtedness of the International & Great Northern.

KANAWHA & MICHIGAN.—The minority stockholders' committee, headed by John S. Stanton, is to bring suit, it is understood, in the interests of dissenting stockholders to prevent the carrying out of the plan by which control of the road has been sold by the Hocking Valley to the Chesapeake & Ohio and the Lake Shore & Michigan Southern jointly.

The minority stockholders' committee, of which George D. Mackay is chairman, says that up to April 5 there had been delivered and paid for in cash, at \$72 a share, \$3,019,700 stock, and that holders of \$371,300 additional stock had consented to the sale.

See an item in regard to this company in Court News.

LAKE SHORE & MICHIGAN SOUTHERN.—This company sold a block of short-term notes in Paris to provide for the expenditures made in the purchase of the controlling stock of the Toledo & Ohio Central and an interest in the Kanawha & Michigan. No official statement has been made as to the amount of notes sold. Officers of the company are quoted as saying that the amount is not large.

MOHAWK VALLEY CO.—See New York State Railways.

MISSOURI, OKLAHOMA & GULF.—The Banque Franco-Americaine, Paris, has bought \$2,950,000 bonds of the Missouri, Oklahoma & Gulf. This purchase, together with \$2,500,000 bonds bought in 1909, makes \$5,450,000, the entire outstanding bonded debt of the railway company.

NEW YORK, PHILADELPHIA & NORFOLK.—Stockholders are to vote April 7 on the question of increasing the capital stock from \$2,500,000 to \$3,750,000. All of the stock now standing is held by the Pennsylvania Railroad, with the exception of \$7,250.

NEW YORK STATE RAILWAYS.—The New York Up-State Public Service Commission has given permission to the company to increase its stock from \$23,140,200 to \$23,860,200, and to make a first consolidated and refunding mortgage to secure \$35,000,000 50-year 5 per cent. bonds, of which \$4,508,634 bonds are to be issued at once. The \$720,000 new stock is to be exchanged at par for stocks of the Rochester & Suburban, the Rochester & Electric and the Ontario Light & Traction Companies, now held by the Mohawk Valley Co. The \$4,508,634 bonds now issued are for the purpose of refunding or discharging indebtedness of the subsidiary electric railway companies.

PENNSYLVANIA RAILROAD.—A bill has been passed by the New Jersey legislature permitting the Pennsylvania Railroad to lease the property of the Pennsylvania Tunnel & Terminal Company, which built the North river tunnels of the Pennsylvania's New York extension.

ROCK ISLAND COMPANY.—Percival Farquhar and F. S. Pearson have been elected directors, succeeding G. T. Boggs and R. L. Skofield, resigned.

ST. LOUIS & SAN FRANCISCO.—The company has sold to a syndicate of St. Louis bankers \$6,000,000 New Orleans, Texas & Mexico first mortgage 5 per cent. bonds. These bonds are being offered to the public at 95, yielding about 5.35 per cent. Of the total \$50,000,000 authorized bonds, \$16,000,000 are understood to have been issued. Of the bonds issued \$10,000,000 have been deposited as security for an issue of \$8,000,000 three-year 5 per cent. notes.

See Beaumont, Sour Lake & Western.

ST. LOUIS SOUTHWESTERN.—This company has arranged to take over the Stephenville North & South Texas running from Stephenville, Tex., to Hamilton, 43 miles.

SEBASTICOOK & MOOSEHEAD.—The reorganization committee says that nearly 90 per cent. of the outstanding bonds have been deposited with the Guardian Savings & Trust Co. of Cleveland under terms of the agreement of May 12, 1909. Bonds will be used for deposit under this agreement up to April 20, 1910. The road, which runs from Pittsfield, Me., to Mainstream, is to be sold by the receiver at an early date.

TOMBIGBEE VALLEY.—The company has authorized \$400,000 general mortgage 6 per cent. bonds of 1910-1935, secured by a mortgage at the rate of \$3,000 per mile of line. F. J.

Lisman & Co., New York, have bought \$186,000 bonds issued against 62 miles of completed road. The Tombigbee Valley and the Alabama, Tennessee & Northern are controlled by the same interests, and it is planned to build within the next two years 80 miles of line to connect the two roads.

TONOPAH & GOLDFIELD.—George Wingfield has been elected a director, succeeding R. H. Rushton.

UNDERGROUND ELECTRIC OF LONDON.—The report for the half year ended December 31, 1909, shows that full interest charges were earned on the £3,000,000 (\$15,000,000) 4½ per cent. bonds. The bonds are followed by £5,200,000 6 per cent. income bonds. Since December 31 the earnings of all the controlled companies show an increase over last year.

UNITED RAILWAYS OF YUCATAN.—Arrangements have been made for the sale, through the National Bank of Mexico, of £825,000 (\$4,125,000) 5 per cent. mortgage bonds of the United Railways of Yucatan.

VANDALIA.—This subsidiary of the Pennsylvania has declared a quarterly dividend of 1¼ per cent., payable May 25. This is at the rate of 5 per cent. annually and corresponds to the 5 per cent. annual rate heretofore paid in semi-annual payments. The Pennsylvania now pays its dividends quarterly instead of semi-annually.

WABASH.—The United States Circuit Court of Appeals has held that the lower court did not have jurisdiction in the suit brought by James Pollitz against the Wabash. The lower court decided on the fact that the refunding of the indebtedness of the Wabash by mortgages made subsequent to the indenture securing the debenture A and debenture B bonds was legal. The legality of this refunding was attacked by James Pollitz, a minority debenture B bondholder. Nearly all of both the debenture A and debenture B bonds have been retired under the refunding plan, but a small minority of the B bonds are still outstanding, and it is the contention of the complainant (Pollitz) that the provisions of the indenture securing these debentures is so worded that the Wabash cannot legally make a comprehensive mortgage secured on all its property while any debentures are outstanding, and there is no provision in the indenture by which the railway can compel the holders of debenture Bs to exchange their security for others.

FOREIGN RAILWAY NOTES.

The Austrian State Railroads are equipping 773 locomotives for burning crude petroleum. These are to be used not only on lines entering Galicia, where the oil wells are, but also on many steep grades and in tunnels in the Alps, where the smoke of coal is excessive and sometimes dangerous.

The government of Costa Rica has extended to December 31, 1911, the period for the free export of woods through the port of Puntas Arenas and other Pacific ports. Exception is made in the matter of cedar less than 40 centimeters in diameter, which will continue to pay the specified duty.

The Cape-to-Cairo Railway is now open from Khartoum southward 120 miles to Wad Medani, trains running each way three days in a week. Wad Medani is an important place on the Blue Nile, being the headquarters of the governor of the province. South of this place track is being laid at the rate of a mile a day. After running south 50 miles the line turns westward to Kosti, on the White Nile.

The passenger rates on the Russian railways were advanced July 1, 1908. They had been very low and were not raised very much. But the result has been unsatisfactory, the number of first-class passengers having decreased 10 per cent. and of second-class 7½ per cent., while the third-class increased 14 and the fourth-class 30 per cent. The number of third-class passengers was 123 times as great as the number of first-class.

Supply Trade Section.

The Linde Air Products Co., Buffalo, N. Y., will, on May 1, move its New York office from 346 Broadway to 30 Church street.

On May 1 the Chicago office of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., will be moved from the Fisher building to the Peoples' Gas building.

S. M. Wight, signal inspector, Lake Shore & Michigan Southern, at Cleveland, Ohio, has resigned to take a position with the General Railway Signal Co., Rochester, N. Y.

The Chicago offices of the Q. & C. Co., New York, will, after April 26, be located in the Peoples' Gas building. All matters pertaining to track appliances will be handled in this office.

The Stevens Point Foundry & Machine Co., Stevens Point, Wis., has been awarded the contract for furnishing all castings to be used on the Chicago division of the Soo line during the ensuing year.

Frank L. Norton, formerly manager of eastern sales of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has been elected vice-president in charge of sales, with office, as heretofore, at No. 1 Wall street, New York.

The Sellers Manufacturing Company, Chicago, will on May 1 move its general sales department from the Western Union building to the 12th floor of the new McCormick building, Michigan avenue and Van Buren street.

S. R. Fuller, Jr., formerly of the Gould Coupler Co., New York, has accepted a position as sales agent for the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo. Mr. Fuller will have headquarters at No. 1 Wall street, New York.

The Davenport Locomotive Works, Davenport, Iowa, announces that effective March 15, A. L. Hageboeck, vice-president in charge of commercial affairs, will be in full charge of the sales department, vice A. E. Rosenthal, resigned.

Benjamin K. Hough has been appointed Boston sales manager of the Wisconsin Engine Company, Corliss, Wis. Mr. Hough will have offices in the Oliver building, Boston, Mass., and will represent the company in the New England States.

George L. L. Davis, formerly with the U. S. Metal & Manufacturing Co., New York, has accepted a position as assistant to the vice-president of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., with headquarters at 1401 Syndicate Trust building, St. Louis, Mo.

The Ingersoll-Rand Company, Chicago, will install a complete compressed air equipment plant for the George W. Jackson Company, Chicago, for its contract on section 54 of the Catskill aqueduct at Yonkers, N. Y. The order includes compressors, drills, mountings and air re-heaters.

The Jewell Belting Co., Chicago, announces that it has relinquished the agency for the sale of mechanical rubber goods made by the Boston Belting Co., Boston, Mass. The latter company has opened an office at 177 Lake street, Chicago, with M. S. Curwen as manager of sales in charge of the office.

The Federal Creosoting Company, Indianapolis, Ind., has been incorporated with a capital of \$1,000,000. The new company is a consolidation of the Federal Creosoting Company, Toledo, Ohio; the National Creosoting Company, Paterson, N. J., and the Colonial Creosoting Company, Hillsboro, N. J.

Burton W. Mudge & Co., Chicago, will, on May 1, remove their general office from the Commercial National Bank building to temporary quarters in suite 1003, Peoples Gas building, until the southern portion of the same building is completed, when they will occupy offices overlooking Michigan avenue and Adams street.

Messrs. Edgar Allen & Co., Ltd., of Imperial Steel Works, Sheffield, England, are at present building and equipping an extensive plant at Chicago for manufacturing their Stag brand manganese steel products, railway frogs and crossings. This branch of the organization was recently incorporated at Springfield, Ill., with a capital stock of \$500,000.

The Acme Railway Equipment Co., Philadelphia, Pa., has recently furnished its Acme uncoupling device for use on the following equipment: 2,150 cars for the Lehigh Valley; 5,000 miscellaneous cars for the New York, New Haven & Hartford; 2,000 box cars for the Boston & Maine, and 200 ore cars for the Minneapolis, St. Paul & Sault Ste. Marie.

A. E. Rosenthal, formerly sales manager of the Davenport Locomotive Works, Davenport, Iowa, has been appointed western representative of the Lima Locomotive & Machine Co., Lima, Ohio, and will open an office on May 1 at 1122 and 1123 McCormick building, Chicago. The Chicago office will handle the sales of direct-connected locomotives in particular, but the company is prepared to build all classes of engines, including standard switchers and road engines.

Frederick Mortimer Robinson, for the past six years sales agent of the Pressed Steel Car Company, Pittsburgh, Pa., died on April 2. Mr. Robinson was 33 years of age, and had formerly been connected with the Chesapeake & Ohio Railroad. He was a Knight Templar and a member of the Acca Temple of Shriners, at Richmond, Va., a member of the Commonwealth Club of Richmond, the Cleveland Coal Club, the Union Club of Pittsburgh, the Railway Club of Pittsburgh, and the Virginia Historical Society of Richmond, Va.

The Union Switch & Signal Company, Swissvale, Pa., announces that George A. Blackmore will be associated with S. G. Johnson as assistant Eastern manager, announcement of whose appointment as general sales manager, with office in New York, was made in the *Railway Age Gazette* of February 4. W. M. Vandersluis has been appointed assistant Western manager, with office at Chicago, succeeding W. E. Foster, resigned. The Montreal office will be closed, and V. K. Spicer will be assigned to special duty at the Western office.

The Isthmian Canal Commission will receive bids until May 5 for steel rails, track frogs, switches, switch stands, tie plates, angle bars, rail braces, track bolts and spikes, galvanized roofing, rivets, bolts, nuts, boat spikes, iron and lock washers, chain, wire cable, boiler tubes, brass and copper tubing, babbitt metal, copper, brass, bronze, muntz metal, etc. (Circular No. 573); until April 28 for a track pile driver (Circular No. 573-B), and until May 9 for push cars, trolley hoist, angle bars, track spikes, banca tin, brass unions, flexible joints, air-brake hose, rubber belting, mineral lubricating oil, etc. (Circular No. 574.)

TRADE PUBLICATIONS.

Roll Crushers.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued bulletin No. 39 describing Jeffrey roll crushers, with a number of half-tone and line illustrations showing these crushers assembled and in detail.

Generators and Motors.—The Western Electric Co., New York, has just issued bulletin No. 5132-1 describing its type EC belt-driven, Hawthorne generators, and also bulletin No. 5360, describing its Hawthorne small power motors. These bulletins contain complete descriptions of the construction and operation of these generators and motors, with a number of illustrations of the different types of each.

Transformers and Rotary Converters.—The General Electric Co., Schenectady, N. Y., has just issued bulletin No. 3919, containing a very complete description of its facilities for the manufacture of transformers, along with illustrations and a description of the various processes in their manufacture. This company has also issued bulletin No. 4723 describing its regulating pole rotary converters, with capacities of from 300 to 3,000 k.w., with a voltage range between 240 and 500, to cover the usual lighting circuit requirements.

Designing Data.—The North Western Expanded Metal Co., Chicago, has issued a booklet, "Designing Data 1," which is a consolidation of booklets Nos. 1, 2, 3, 4 and 5, with parts of No. 6 and its overcoated house booklet, which were issued

in 1908 and 1909. The company has also issued booklet No. 8 on highway bridges. These publications contain a large amount of valuable information relating to building construction, being valuable reference books for architects, engineers, contractors and others interested in building construction.

Railway Motor Cars.—Fairbanks, Morse & Co., Chicago, have just issued catalogue No. 101B on motor cars for railway service, including all types from the small car light enough for one man to handle to the large passenger car seating 35 people. Two new gasoline section cars are shown and the 35-passenger car is especially featured. The catalogue is made up in an attractive form and includes many excellent half-tones. Most of the illustrations are of cars in actual service, about 5,000 of the company's cars now being in use on the railways of this country.

Meters, Fan Motors, Arc Lamps, etc.—The General Electric Co., Schenectady, N. Y., in bulletin No. 4,721 describes its d.c. watt-hour meters, type C-6, C-7 and C Q; in bulletin No. 4,720 its steam and air flow meters; in bulletin No. 4,716, several types of prepayment watt-hour meters, made for two or three wire service and 100 to 120 or 200 to 240 volts, either direct or alternating current; in bulletin No. 4,719, its fan and small power motors for use with fans in residences, offices or public buildings, and also its fans for ventilating purposes; in bulletin No. 4,717 its flame arc lamps for lighting streets and large interiors; and in bulletin No. 4,722, the use of electric drive in cement plants.

Cardwell Friction Draft Gear.—The second story of the Animal Line Railway, which was created in the imagination of Bruce V. Crandall for the story of the Bettendorf Bears, has been written by the same author and published by the Union Draft Gear Co., Chicago. In the introduction the author dedicates the second story to the "children of the railway fraternity" who received his first effort so kindly, and a glance at the new book indicates that it will be as well received as was the former one. The theme is a draft rigging test conducted by Mr. Reynard Fox, the "G. M." of the Animal Line in the presence of all the animals, in which the superiority of the Cardwell friction draft gear is demonstrated. The story is supplemented by six full-page illustrations in color, showing the alleged experiences of the Animal Line with spring-gear and the subsequent adoption of the Cardwell.

RAILWAY STRUCTURES.

ALTOONA, PA.—See Johnstown & Altoona (Electric) under Railway Construction.

BALTIMORE, MD.—A contract has been given to J. Henry Miller, Baltimore, Md., for the new union passenger station to be built by the Northern Central. (April 8, p. 947.)

BASSETTS, TEX.—The St. Louis Southwestern has prepared plans for a new station following the filing of a complaint by the citizens. The new plans have been submitted to the citizens and to the state railway commission for approval.

BEMIDJI, MINN.—The Minnesota & International has opened its new district yards and freight houses for the handling of business at the new district terminal. A coal chute, a sand drying house, water tank and roundhouse have also been completed.

BIG SPRINGS, TEX.—The Texas & Pacific has let the contract to the Hughes O'Rourke Construction Co., Dallas, Tex., for a passenger station to cost \$40,000. (Feb. 12, 1909.)

BIRMINGHAM, ALA.—An officer of the Atlanta, Birmingham & Atlantic writes that work was started last month by J. B. Anderson & Company, Birmingham, on a corrugated iron and brick freight house and office building for the Alabama Terminal Railway. The building is to be 20 ft. high, 38 ft. wide and 349 ft. long, on concrete foundations, and is being put up at Eleventh street and First avenue, in Birmingham. The cost of the improvements will be \$15,000. (April 8, p. 974.)

BOYLES, ALA.—An officer of the Louisville & Nashville writes that the company will put up the new shops at Boyles with its own men, and will probably not let any of the work. (Jan. 21, p. 167.)

CHICAGO.—The Baltimore & Ohio Chicago Terminal is to build new freight receiving and delivering stations. A new train shed will also be built at the Grand Central station and the interior of this building will be rearranged.

DEFIANCE, OHIO.—The county commissioners are said to have decided to build a combined highway and street railway bridge in Defiance. The structure is to have two spans, with a total length of 400 ft.

EDMONTON, ALB.—See Canadian Pacific under Railway Construction.

FT. WORTH, TEX.—The Northern Texas Traction Co. has plans made for a new car barn 100 ft. wide and 165 ft. long, to be built west of the present barns. It will have a concrete roof and floor.

LORAIN, OHIO.—Contracts have been let for extensive improvements to the Baltimore & Ohio facilities for handling ore on its docks at Lorain, Ohio, to cost about \$500,000. The 460,000-ton capacity ore handling and storage plant on Lake Erie, at the mouth of Black river, covers approximately nine acres and is used for storage and unloading purposes. The ore is to be unloaded from lake boats by three Brown hoisting unloaders made by the Brown Hoisting Machinery Co., Cleveland, Ohio, each to have a capacity of 350 tons per hour. The machinery will be operated by electric current, which will be generated in a new power house to be built adjacent to the storage yard. This building will be of brick construction, two stories high, 70 ft. x 90 ft., and will contain two 1,000-h.p. Buckeye engines and two 500-kw. Westinghouse electric generators, the current to be carried by cables in underground conduits to the conductor rails. The foundation walls carrying the unloaders and the tram bridge will be of concrete with steel reinforcement partly on solid ground and partly on piling. A concrete dock and timber cribbing, 845 ft. long, will be built along Black river.

MIDDLETOWN, CONN.—See New York, New Haven & Hartford under Railway Construction.

NEGAUNEE, MICH.—The Chicago & North Western and the Duluth, South Shore & Atlantic are considering the question of building a new \$30,000 union station. It is reported that an agreement has been reached to build the new station directly west of the present building.

NEWARK, N. J.—The Pennsylvania Railroad is considering certain improvements at Market street, including rebuilding the present station and providing six tracks instead of the present four tracks. Nothing definite has as yet been decided.

OUTLOOK, SASK.—See Canadian Pacific under Railway Construction.

SOMERSET, WIS.—Bids will be asked for about April 18 by the Minneapolis, St. Paul & Sault Ste. Marie to build a new bridge over the St. Croix river near Somerset. About 5,000 tons of structural steel will be used in the construction of the bridge. The improvements will cost about \$600,000.

STOCKTON, CAL.—According to press reports the Southern Pacific will spend about \$500,000 for improvements, including new yards and station buildings at Stockton.

STRATFORD, ONT.—The Grand Trunk has submitted a proposition to residents of that place agreeing to build a new station and put up a new foundry and other shops, at a cost of between \$200,000 and \$250,000. The city officials must agree to close a portion of Downie street and build a subway for street traffic under the railway tracks at Nile street.

SUPERIOR, WIS.—Work is now under way by Schmidt Brothers & Hill on the concrete foundations for the large new ore dock for the Great Northern being built at Allouez, Lake Superior. The United States Steel Corporation has the contract for the steel work. The new dock will cost \$1,000,000. (Oct. 29, p. 832.)

TAMPA, FLA.—The Tampa Union Station Co. has been incorporated to build terminals for the Tampa Northern, the Atlantic Coast Line and the Seaboard Air Line. The station building is estimated to cost between \$175,000 and \$200,000.

TWO HARBORS, MICH.—The Duluth & Iron Range has let the contract for building an ore dock to the Barnett & Record Co., Duluth, Minn.

Late News.

The items in this column were received after the classified departments were closed.

L. B. Rhodes, master mechanic of the Georgia, Southern & Florida, has been appointed superintendent of motive power of the Virginian Railway.

Grading work is said to be under way by Cain & Dickens, on an extension of the Laramie, Hahn's Peak & Pacific, from Foxpark, Wyo. The line is to be continued south via Walden, Colo., to Hebron, about 50 miles. (Mar. 11, p. 547).

The Pennsylvania Railroad on April 13 ran the first electric train through the tunnels under Manhattan Island and the East River. The train, made up of six construction cars and an electric locomotive, ran from the station in New York to the Thompson avenue viaduct in Sunnyside yard, Long Island City.

A. C. Spencer, general roadmaster of the Southern division of the National Railways of Mexico, at Queretaro, Mexico, has been appointed superintendent of construction, with office at San Juan, Nuevo Leon, in charge of the erection of the San Juan bridge. This is to be a reinforced concrete structure, of eight spans, each 175 ft. long, to have a total length of 1,400 ft., and will be one of the first reinforced concrete bridges built in Mexico.

Noble C. Butler, special master in the Chicago, Cincinnati & Louisville Railway bankruptcy, has recommended in a report to the Federal Court that the property be sold under foreclosure in its entirety, and that the proceeds after the payment of costs and expenses, receiver's certificates and preferred debts, be applied to the satisfaction of the mortgages. There are three divisional mortgages aggregating \$3,154,000 and a general mortgage for \$3,016,000.

The Delaware, Lackawanna & Western has made an increase of 6 per cent. in the pay of all employees in the transportation department, except the men on trains. The number affected is said to be 6,500. The 1,500 switchmen are given an increase of three cents an hour. The increase takes effect as of April 1. Men in road service, conductors, brakemen, enginemen and firemen are not included, as negotiations with committees of these classes are still going on.

Bids are to be asked for in from 30 to 60 days by the Arizona-Mexican Construction Co., Room 1408, 11 Pine street, New York City, to build under the name of the Arizona, Mexico & Gulf, from Tucson, Ariz., southwest to Port Lobos, in the state of Sonora, Mex., on the gulf of California, 210 miles. The line is to be built under the direction of the Development Company of America, New York. F. M. Murphy is president of the development company, also president of the railway company, with office at New York City.

As mentioned in another column, more than 50 manufacturers of railway equipment, materials and supplies attended at Columbus, Ohio, on Tuesday evening, April 12, a hearing before the Senate Committee on Commercial Corporations on the Woods Utilities Bill, to protest against the enactment, without substantial amendment, of that measure in the form in which it had passed the Ohio house. The demonstration was organized by the Railway Business Association through its Ohio Business Committee, of which A. M. Kittredge, president of the Barney & Smith Car Co., Dayton, Ohio, is chairman. S. P. Bush, president of the Buckeye Steel Castings Co., Columbus, Ohio, and Mr. Kittredge addressed the committee.

A number of railway counsels and representatives of interurban lines, express companies and railway employees, as well as the Ohio Shippers' Association, argued against the various provisions of the bill. The most comprehensive of these addresses was that of Hon. S. H. Durbin, representing the Baltimore & Ohio Railroad. Numerous further amendments to the bill which, as it passed the House, comprised 144 sections, were handed to the committee during the hearing. There was no witness in favor of the bill and the chairman did not even ask whether advocates cared to be heard.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

Grant Smith & Co., Chicago, has ordered two 10-in. x 16-in. 36-in. gage saddle tank locomotives from the Vulcan Iron Works.

James H. Corbett, railway contractor, Indiana, Pa., has ordered two 10-in. x 16-in. locomotives from the Vulcan Iron Works.

The Queen & Crescent Route denies the report that it is in the market for 10 Mallet locomotives, as reported in the *Railway Age Gazette* of April 8.

The Georgia, Southern & Florida has ordered four Pacific, nine consolidation and two six-wheel switching locomotives from the Baldwin Locomotive Works.

The Aransas Terminal Railway Co., building at Aransas Pass, Tex., expects to buy motive power in July. E. L. Burton, president, Gibbs building, San Antonio, Tex.

The Chicago, Rock Island & Pacific, reported in the *Railway Age Gazette* of April 8 as in the market for 25 Pacific and 34 consolidation locomotives, has ordered this equipment from the American Locomotive Co.

The Chicago Great Western, reported in the *Railway Age Gazette* of April 8, in an unconfirmed item, as being in the market for 41 locomotives, has ordered 15 consolidation, six ten-wheel passenger and 10 six-wheel switchers from the Baldwin Locomotive Works.

The St. Louis & San Francisco locomotive inquiry, reported in the *Railway Age Gazette* of April 8, should have read eight instead of 80 Pacific locomotives. Eight Pacific and five switching locomotives have been ordered from the Baldwin Locomotive Works and two Mallet locomotives, in addition to the five reported on April 1, have been ordered from the American Locomotive Co.

The St. Louis & San Francisco, as reported in the *Railway Age Gazette* of April 1, has ordered five Mallet locomotives from the American Locomotive Co. Delivery is specified for August, 1910.

General Dimensions.

Weight on drivers	360,000 lbs.
Total weight	417,000 lbs.
Cylinders	24½ in. and 39 in. x 30 in.
Diameter of drivers	57 in.
Type of boiler	Conical connection type
Working steam pressure	200 lbs.
Heating surface, tubes	4,903 sq. ft.
" firebox	350 "
" total	5,253 "
Tubes, number	348
" outside diameter	2¼ in.
" length	24 ft.
Firebox, length	120¼ in.
" width	90¼ "
" material and maker	Otis steel
Grate area	75.2 R.R. Co.'s standard
Water capacity	8,000 gals.
Coal capacity	10 tons

The engines will be equipped with electric headlights and Walschaert valve gear.

The New Orleans, Texas & Mexico, as reported in the *Railway Age Gazette* of April 1, has ordered 5 Pacific, 13 consolidation and 5 switching locomotives from the Baldwin Locomotive Works and 12 consolidation locomotives from the American Locomotive Co. The engines are all to be delivered in August and September.

General Dimensions.

	Pacific.	Consolidation.	Switching.
Weight on drivers	145,000 lbs.	180,000 lbs.	148,000 lbs.
Total weight	225,000 lbs.	201,000 lbs.	148,000 lbs.
Cylinders	26 in. x 28 in.	26 in. x 30 in.	20½ x 28 in.
Diameter of drivers	69 in.	63 in.	51 in.
Type of boiler	Ext. wgn top.	Ext. wgn top.	Straight top.
Working stm. pressure.	160 lbs.	165 lbs.	185 lbs.
Heating surface, tubes.	2,666 sq. ft.		1,814 sq. ft.
" firebox	177 "		142 "
" total.	2,843 "		1,956 "
Tubes, number	198		315
" outside diam.	2¼ & 5 in.		2 in.
" length	20 ft.		11 ft.

Firebox, length	108 in.	120 in.	72 in.
" width	68 in.	60 in.	66 in.
" matrl. & mkr.	Otis steel.	Otis steel.	Otis steel.
Grate area	51 sq. ft.	50 sq. ft.	33 sq. ft.
Water capacity	8,100 gals.	7,600 gals.	4,500 gals.
Coal capacity	8 tons.	8 tons.	.....

The Pacific and consolidation engines will have electric headlights, the Pacifics and 13 of the consolidations will have Emerson superheaters and the 12 consolidations will have Cole superheaters.

CAR BUILDING.

The *Northwestern Pacific* is in the market for 50 forty-ton and 100 fifty-ton box cars.

The *Cincinnati Traction Co.*, Cincinnati, Ohio, has ordered 18 dump cars from Woonham, Sanger & Bates, New York.

The *Isthmian Canal Commission* will receive bids until April 29 for 12 thirty-ton steel flat cars. (Circular No. 573-C.)

The *Lake Superior & Ishpeming* has ordered 100 ore cars from the Clark Car Co., for delivery during the coming summer.

The *Aransas Terminal Railway Co.*, building at Aransas Pass, Tex., expects to buy motive power in July. E. L. Burton, president, Gibbs building, San Antonio, Tex.

The *Elgin, Joliet & Eastern*, reported in the *Railway Age Gazette* of April 1 as being in the market for 500 steel hopper cars, has ordered this equipment from the Standard Steel Car Co.

Lewis T. Le Naire, Tribune building, New York, is asking prices on 50 box cars for early delivery to a South American railway. The order will probably be increased to 100 cars if satisfactory arrangements can be made.

The *Coal & Coke Railway*, reported in the *Railway Age Gazette* of April 1 as considering the purchase of 500 coal cars, is reported to have ordered this equipment from the Cambria Steel Co. This item is not confirmed.

The *St. Louis & San Francisco*, as reported in the *Railway Age Gazette* of April 8, has ordered six gasoline electric motor cars from the General Electric Co. The cars are to be divided into baggage, colored, smoking and first-class passenger compartments, with a total seating capacity of 89. The cars are of all-steel construction with mahogany interior finish, side entrance doors between the colored and smoking compartments and standard observation car rear platforms.

MACHINERY AND TOOLS.

The Boston Elevated has issued a list of about 25 machine tools of all types.

See item regarding machinery installations at Loraine, Ohio, under Railway Structures.

The Pennsylvania is in the market for four boring mills, one 16-in. lathe and one locomotive axle drilling lathe.

Press reports from South Bethlehem, Pa., indicate that the Bethlehem Steel Co. will install in its large plant the following equipment: Six thousand horse-power boiler, three gas engines for electric power, seven new locomotives and nine engines for blowing purposes at the blast furnaces, electrification of mill No. 1, new furnaces at press forge, addition to No. 1 tempering plant, additional tools for No. 6 shop and additional improvements to No. 2 shop. The total cost will amount to \$2,795,000.

IRON AND STEEL.

The *Louisville & Nashville* has ordered from the American Bridge Co. 1,200 tons of structural steel for a viaduct at Henderson, Ky.

The *Chicago City Railway*, reported in the *Railway Age Gazette* of January 21 as in the market for 5,000 tons of rails, has ordered them from the Lorain Steel Co.

The *Oregon Trunk* is taking prices on 4,500 tons of steel for the Columbia river bridge at Celilo, Wash., mentioned in the *Railway Age Gazette* of Dec. 17, 1909, under Railway Structures.

General Conditions in Steel.—Chairman Gary, of the United States Steel Corporation, is quoted as follows: "There has been a steady increase in business since the lull in January. The United States Steel Corporation has now more than 5,000,000 tons of unfilled orders, and during March orders kept up with the capacity of the plants. At the present rate of booking, our mills should continue at full capacity through the rest of the year." According to the Department of Commerce and Labor, exports in iron and steel, not including ore, in February, 1910, were \$13,949,082 as against \$10,947,159 in February, 1909, and for the eight months ended February, 1910, they were \$111,184,177 as compared with \$91,275,211 for the same period in 1909, and \$130,399,349 for the same period in 1908. Imports of iron and steel, not including ore, were \$2,911,686 in the month of February, 1910, against \$1,798,675 in the same month last year, and \$24,157,560 in the eight months ended February, 1910, as compared with \$13,400,630 and \$21,170,314 in the eight months ended February, 1909 and 1908, respectively.

SIGNALING.

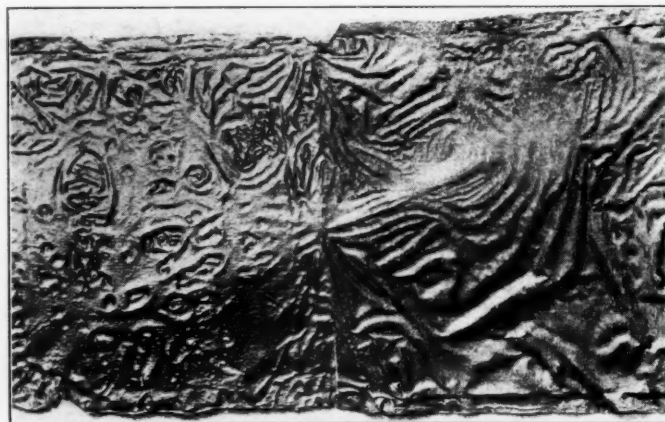
The Rock Island has just finished the change of night color indications of switches and signals on the following divisions: Nebraska, Missouri, Kansas, St. Louis, El Paso. The new colors are red, yellow and green.

The Chicago, Milwaukee & St. Paul is installing three-position, upper quadrant, automatic semaphore block signals between Chicago and Milwaukee, and is changing existing interlocking signals from lower to upper quadrant.

The East Penn branch of the Philadelphia & Reading, from Reading to Allentown, 35 miles, is to be made double track throughout its length, a seven-mile section of second track being now nearly finished; and with this work completed Hall automatic disk block signals will be installed throughout the branch.

Silica-Graphite Paint and Acid.

Corrosion is universally recognized as one of the worst known enemies of a paint applied to the surface of iron and steel, and rust on either side of the film means a certain and more or less rapid deterioration. The action of this corrosion



Three-Coat Dixon Steel Car Paint Skin.

(Removed from surface of steel car after one month's submergence in storage battery residuc.)

seems to be that of cutting under the film of the paint and not only loosening, but causing it to disintegrate. Acid acts in the same manner as common rust to a certain extent, in that,

besides making a direct attack upon the paint film, it has a peeling effect when it has come into contact with the metal. The rapidity with which this peeling takes place depends upon the strength of the acid and the vigor with which it attacks the metal as well, as the resisting qualities of the paint film itself and its adhesion to the metal surface.

It appears from some experiments that have been made with the silica-graphite and steel car paints of the Jos. Dixon Crucible Co., Jersey City, N. J., that even a very strong acid may fail to have a direct effect upon the paint film, even though it be allowed to attack the painted metal surface and to ultimately remove it.

Such results are illustrated in the accompanying half-tone. It shows a paint film of silica-graphite and steel car paint that was originally applied to a sheet of boiler plate. One-half of each of two plates was painted with three coats of the two paints, respectively, and the whole submerged for two months in a bath consisting of the strong sulphuric acid solution of the residue of a storage battery. The acid attacking the metal worked beneath the paint films and succeeded, in the time given, in entirely removing the film of steel car paint and one-half of that of the silica-graphite paint, the other half of the latter remaining closely adherent to the metal.

An interesting feature of this test is that after a lapse of nine months, during which time these films have been subjected to every change of the atmosphere, they remain as soft and flexible as a piece of chamois skin. That the failure of the acid to cause any perceptible deterioration of the film is evidenced by the fact that, when viewed under a microscope, the whole surface is seen to be covered with the fine particles of silica and graphite. It is, therefore, undoubtedly due to the highly resistant and inert qualities of these pigments that the film was so thoroughly protected and shown to be about as nearly absolutely acid-proof as it is possible to make a paint.

Advance Power Co. Inspection Car.

Among the late types of motor-section and inspection cars shown at the exhibition of the Road and Track Supply Association in Chicago, March 14-19, was a 9-passenger inspection



Advance Inspection Car.

car made by the Advance Power Co., 140 Dearborn street, Chicago.

The Advance engine, with which this car is equipped, is of the two-cycle air and vapor cooled, two-cylinder opposed type, developing 20 h.p. This engine has no valves, gears, cams, springs, water connections, radiators or pumps. Simplicity,

durability and high power are obtained by a new method of handling the mixture of gasolene and air which keeps the engine cool, and gives perfect combustion.

Power is transmitted by the Advance rolling contact transmission, consisting of one large fiber-faced disc, keyed on the engine shaft and serving also as a flywheel, against the face of which are two smooth iron wheels on countershafts which are connected to the rear axle by a chain drive.

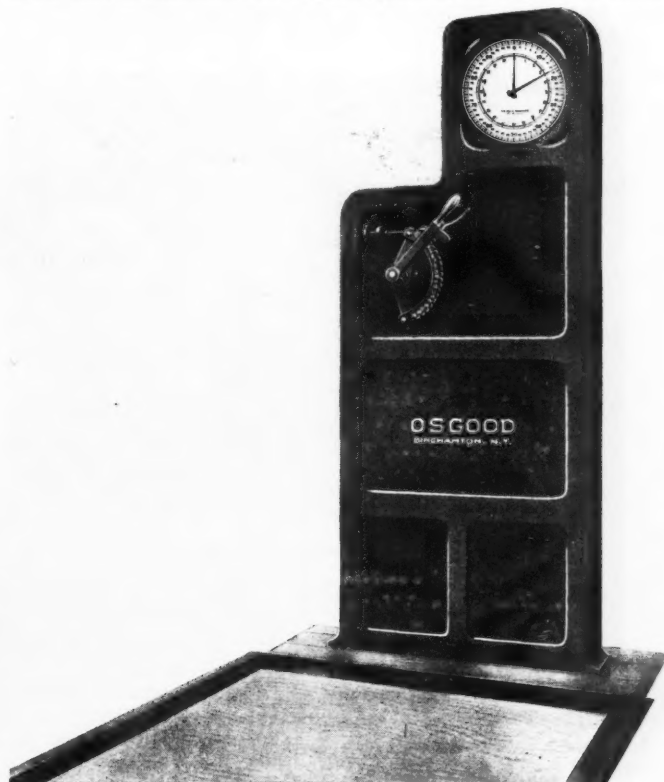
A single lever controls the movement of the car, the same speed being obtained in both directions. The speed is controlled by a hand wheel on a post resembling the steering gear of an automobile, which draws together or spreads apart the two smooth iron wheels on the face of the large disc, giving a positive and quick regulation from zero to full speed.

The accompanying cut illustrates the appearance of the car and shows clearly the compactness of the engine under the front end. The illustration also shows the braking apparatus, the gasolene tank under the rear seat and the simple, durable construction of the car body. This car has traveled thousands of miles and has a record of $\frac{3}{4}$ of a mile in 60 seconds from a standing start to a standing stop, carrying six passengers. It has also been driven up a 12 per cent. grade with 10 passengers at 15 miles an hour from a standing start at foot of grade.

The Advance Power Company also makes motor section cars and double and single truck motor cars for passenger service which are equipped with Advance engines of suitable capacity and the Advance rolling contact transmission. All the special features described are fully protected by United States and foreign patents.

Osgood Automatic Beamless Scale.

In the accompanying half-tone is shown an automatic beamless scale designed for weighing L. C. L. freight, baggage, express, mail, merchandise, coal, etc. Further than providing a scale that is beamless, the Osgood patents, held by the Winters-



Osgood Automatic Beamless Scale.

Coleman Scale Co., Springfield, Ohio, provide for automatically indicating the required weights on a 12-in. diameter dial. The divisions on the dial are made red and black on a white background, and as there are less than three divisions per inch, they are easily and quickly read.

The weight of a load is transmitted through steel yard rods

to the central bearing of an equal arm lever. One-half of the load strain so transmitted is carried through a spring to a small cone pulley by a connecting rod and steel tape. The other half of the load strain is transmitted through a spring, hook rod and thermostat lever to a segment drum. Five-sixths of this load strain is absorbed by the fulcrum bearing, the remaining one-sixth only being transmitted to the indicating mechanism.

The long black hand is attached to the shaft of a pinion, which is operated by a rack attached to an aluminum rod, the lower end of which is hinged to the thermostat lever above mentioned. The smaller red hand is attached to the shaft of a pinion, operated by a rack secured to an aluminum rod, the lower end of which is hinged to another lever.

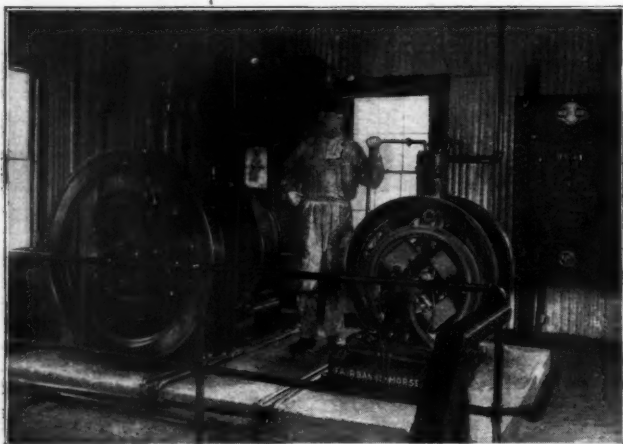
For the purpose of balancing, a cone pulley is employed, the cones of which are so connected that by means of a thumb-screw, which operates in conjunction with the quadrant shown, the movements of the hands are controlled in unison. When out of balance both hands can be brought back to zero or drawn back to allow for tare. Dashpots are used to prevent excessive vibration of the hands. The rods which connect the main lever with these dashpots are fitted with plungers, which are submerged in a special anti-freezing oil in the dashpots.

These scales are at present in use on the following railways: Atchison, Topeka & Santa Fe; Chicago, Rock Island & Pacific; Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul; Chicago, Milwaukee & Puget Sound; New York Central & Hudson River; Long Island; Erie, and Delaware, Lackawanna & Western.

Charging Outfits for Storage Batteries.

The installation of electric signals on railways necessitates the use of a storage battery, which must be kept charged to insure the operation of signals.

The accompanying half-tone shows a charging outfit made by Fairbanks, Morse & Co., Chicago, and now in use in a plant of the Norfolk & Western. The large machine con-



Charging Outfit on Norfolk & Western.

sists of a 12-h.p. Fairbanks-Morse gasoline electric engine, direct connected to a 7½-k.w. Fairbanks-Morse dynamo. The small outfit is a 6-h.p. special electric gasoline engine and a 3½-k.w. generator.

The Norfolk & Western has several of these sets in use on its line. These outfits are said to be both reliable and economical. Both engines and dynamos are made in the same shops.

Burton Track-Laying Machine.

The Burton Track-Laying Machine Co., Salt Lake City, Utah, will soon place on the market a track-laying machine patented by Charles W. Burton. It has been carefully tested, and a complete outfit is now being prepared for demonstrating its operation.

The machine consists of a platform mounted on standard

tracks, having four posts, one at each corner, the tops of which are connected in pairs by cross-beams supporting three longitudinal hanging tracks. These tracks extend some distance behind the machine, reaching over the tie and rail cars, and in front over the roadbed. The cantilever ends are supported by over-truss rods. The rail car is attached directly behind the track-laying machine and the tie cars behind the rail car. The rails are transferred from the car to the roadbed by carriers running on the outside tracks, which have a special hoisting device to eliminate manual labor as far as possible. The tie carrier is an open car which is loaded with ties, hoisted by compressed air jacks, and run forward on the middle track. The ties are dumped automatically when the front wheel of the car strikes a sharp downward incline at the front end of the track. A bumper is arranged to stop the car suddenly on this incline and a roller in the floor of the car facilitates the dumping of the load. In operation, as soon as a loaded tie car passes the rail car, each rail carriage picks up a rail, fishplates being bolted to the forward end and temporary spacing bars clamped on the base during the raising. By this time the ties have been deposited on the roadbed, the car has been run back out of the way, and the ties properly distributed. The rail carriages are then run forward, the rails deposited on the ties and a single bolt inserted in the fishplate to secure the new rails to previous work. Since the ties and rails are brought forward on separate tracks, there is no interference between the two operations, and no delay in completing the track.

FOREIGN RAILWAY NOTES.

A British syndicate has received a contract from the Chilean government for the construction of a railway to parallel the coast for a distance of 446 miles, running from Pueblo Hundido, about 450 miles north of Valparaiso, and ending at Lagunas, about 60 miles southeast of Iquique. The road is to be completed within four years at a cost of \$14,870,807 United States gold.

The Government of Panama has presented a proposal to the Canal Zone Government for the building of a railway between Panama and David by the Panama Railroad. The government wishes to contract with the Panama Railroad for the construction of the railway, a distance of 274 miles. In this is included a branch extending into the Province of Los Santos, also other branch lines that may be necessary for the complete development of the Republic.

The report of the Central Uruguay railway for the year ended June 30, 1909, shows gross earnings of \$2,785,610 as compared with \$2,040,220 in the previous year, with net profits of \$1,348,058, or an increase of \$168,385. On the eastern extension a section of 33 miles was opened to the public in November, 1908, additional sections being opened in July and August, 1909, respectively, so that the total length now being operated is 246 miles.

The line of railway to connect Medellin with the Cauca river at a point between the mouths of the Amaga and Poblano rivers is reported by the Belgian consul at Bogota to be under active construction. The road is the property of a Colombian company capitalized at \$1,000,000. The railway will serve a very fertile region and will be especially advantageous to coffee growers. During 1910 the company will place orders for 1,000 tons of rails of the Vignole pattern.

It is said that the contract for the 75 miles of connecting railway between Zacapa and Santa Ana, Salvador, has been let to Myron C. Keith, president of the United Fruit Co. The road will be standard gage and will be completed within 18 months. Surveys and locations have already been made and materials ordered. On the arrival of the materials work will be immediately commenced from the Santa Ana end of the line. This line will connect the Salvador Railway with the Guatemala Railway, thus making a link between the two republics.